POPULAR AVIATION

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How I Locate Hurricanes

By SELBY MAXWELL

Meteorological expert specializing in hurricane and tornado predictions.

Approaching the first hurricane from the northwest. Taken September 7, 1935, from southeastern Indiana with the storm-center far to the east over the Atlantic coast. Such fracto-cumulus clouds are characteristic of the cold-front on the western sides of this type of storm.

The mackerel sky taken near Norfolk, Virginia, on September 9, showing the cirro-stratus formation of clouds as the second hurricane draws near. Shortly after this picture was taken, we began to meet drizzling rains and thunder squalls.

WEATHER forecasting by Astronomy! Locating the position of storms in the way that a navigator finds latitude and longitude! Could it be possible?

As a young student of astronomy in Northwestern University, I have often asked myself these questions. Such a thing had never been done before. No one had ever forecast weather by any but the most empirical of methods. No one knew why weather happens as it does. No matter, I would do it!

But, dear reader, it is a long road from sitting in an armchair and reasoning out how weather ought to act and doing it in practice. The road, for me, was more than twenty years long. Twenty years of hunting, searching, computing, evaluating, digging up values for my constants, making sure that the formulae were really as good in practice as they looked in theory.

When I first began a critical study of the "why" of weather, I subjected every known theory of weather forecasting to the most exhaustive of tests. I spent two years seeking, and at the end of this two years testing period, I found that not one of the accepted ideas of weather was worth anything. They were all faulty.

But one superstition kept coming up again and again with enough persistance to merit my closest attention, the superstition that the moon makes weather. I could correlate weather changes with the various motions of the moon about sixteen times out of every twenty, which is a higher percentage than anything else in all the natural periods of rhythm about me could give. So now I set to work in earnest to find out how the moon makes the weather go.

There is no need to burden you with the mathematical details of my long years of toil. Suffice it to say that there finally came a day when I sat in a swift automobile, racing across the country in search of a hurricane storm.

In my hand I held a chart, a forecast sheet, computed in advance, telling me when and where I might expect to find this storm. I did find it, where I had expected to locate it, and within a few hours of the computed time. The pictures of my storm are printed here, together with a map of the path I took and a map of the storm details that I expected to meet.

Before I left, I took the precaution to give copies of the forecast to officers in the U. S. Navy and various Weather Bureau men, newspaper men and others and as I went along, I sent back postcards telling what sort of weather I was meeting from time to time. The time stamps in the postmarks thus furnish complete evidence that I was in the storm area at the time when official records show that a storm was there, so no one in the Weather Bureau or the Navy now questions my ability to find storms.

Many people interested in weather have asked me how I could tell when a tropical storm was going to blow and, having foretold it, how I could travel unerringly into the point of heaviest intensity. I compute storms from the motions of the moon.

Scientists have hitherto looked upon the moon as either a dead body or, at any rate, as a reflector of sunlight only, entirely overlooking the fact that the moon most profoundly disturbs the motion of the earth in its orbit and causes our day to sensibly vary in length over short intervals of time.

The perturbations of the moon that make weather are never more than a few hours long, but they are often rather intense.

The earth and moon revolve as they travel about the sun, spinning together about their mutual centers of gravity. Owing to the fact that the moon weighs 1-81 as much as the earth, the center of balance of the two is markedly displaced away from the center of the earth; in fact it lies about a thousand miles under our feet and three thousand miles away from the center of the earth.

This three thousand mile difference between the center of suspension and center of rotation of the earth acts like a lever, whereby the moon is able to impress its every motion upon the ball of the earth.

Those lunar motions that occur in an east-west direction vary the rate of spin of the earth, and because the earth is rotating on its axis as well as revolving about its center of suspension, there is a precessional effect whereby differences in spin are turned into north-south thrusts of the air. These thrusts of air make the "air masses" which are attracting so much attention from scientists just now.

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In the Interest of Science

THIS intensely interesting story on storms is of vital interest to everyone connected with aviation for the mathematical methods of storm prediction originated by the author may solve aviation's greatest enemy—storms.

Mr. Maxwell has been unusually successful in applying his principles to the location of storms and the accompanying article is just one instance out of many where he has sought out hurricanes and found them on scheduled time.

We know in much detail just what the moon is going to do. The Navy issues lunar tables in most comprehensive form, in the Nautical Almanac. Knowing what the moon will do in any given instance, we can therefore determine what the weather will do.

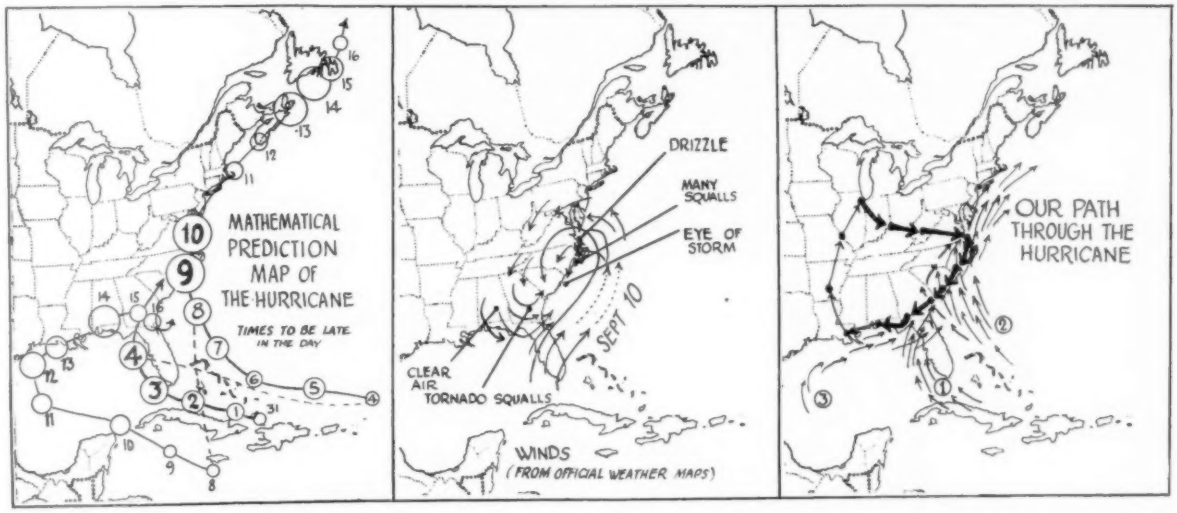
I looked up the lunar action for the first two weeks of September of this year, and saw that the moon would perform evolutions that would surely create three hurricane storms in the southeastern part of this country. After carefully computing all the elements, just as I might have computed an eclipse or a transit, let us say, I found that a nest of storms would send one hurricane up on August 31, to September 4, another one from September 8 to 16, and a third one, very tiny, near September 12 to 16. The first storm would move in the region of Florida, the second would move along the Atlantic coast and the third would be confined to the Gulf region.

But how could I find these storms, even if I did start after them? In a storm, the sky is obscured, the visibility is low and at night nothing at all can be seen. To find them I built a radio storm-detector.

A radio storm-detector is essentially

Hurricane squall. This scene was taken off Wilmington, North Carolina, on September 10. The squall is beating down on us with great speed. The white patch on the ground is a wall of rain, and an instant after the picture was taken, a solid sheet of flying water hit us.

TORNADO! Near Waycross, Georgia, we met this tornado coming directly at us. We were nervous but we stood our ground, set up the camera and took this shot. The roar of the storm and the motion of the winds made it a terrifying spectacle.



Maps of the predicted hurricane and the path taken by Mr. Maxwell and his companion through the territory swept by the hurricane. The heavy arrows on the right-hand sketch show how the party contacted the storm.

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a radio-compass built especially for static. As the storm forms, it emits a definite sound. As it moves it emits another sound. As it dies out it emits still other sounds. These differences in sound come from the formation of small rain drops into big drops, their rate of fall and other technical considerations of storms.

There is a great deal of difference in the sound of storms, just like there is difference in the appearance of storms to the eye. I asked my brother Alexander Maxwell to go along to operate the radio storm-detector, because he is highly skilled in such matters.

We divided the work between us, he was to operate the storm-detector, while I was to operate the meteorological instruments and interpret the results. Our teamwork was good. We went straight into the center of the storm with no trouble at all.

As soon as the first storm of the series was visible over the Florida straits we set out. As this storm came up the Atlantic coast, we headed east from Chicago, aiming to intercept it at Norfolk, Virginia. Pausing at Cincinnati, we took a radio bearing of the storm and found it still at sea off the Carolinas. We later took another bearing from the top of the mountains in West Virginia, and got it still at sea. This was on September 7th.

As you can see from the map, the first hurricane was broken in two parts at this time, with the remnants of the first storm moving up the coast, while the second was following up the Gulf stream. When we got to Norfolk, we beheld the first storm off the Jersey coast, retreating.

We went to the Navy Yard for a while, to pay an official call, and from there we headed down the coast, keeping as near the seashore as possible, to intercept the second storm when it should run ashore. On the evening of September 9, south of Norfolk, we met the first mackerel skies of the second storm and, at ten that night, we ran into the first thunder squalls.

It stormed intermittently all night in North Carolina. A little way below Edenton we took another bearing and found that the storm was off the South Carolina coast and so close that the noise of it in the radio was deafening. Where we were located it was calm but the winds overhead were high. Most hurricane winds, we found, expend themselves aloft. It can be blowing a gale up in the air and still be tranquil on the ground.

The rain kept getting heavier and heavier as the day advanced. North of Wilmington, North Carolina, we met the heavy squalls of the storm. They were like ordinary thunderstorms, except that there must have been hundreds of them in the great hurricane whirl. We went through thirty-four squalls and there were many others that we could see but which did not touch us.

The average squall is only a few miles wide, and each has a more or less boiling nucleus. Sometimes this nucleus is a tornado, sometimes a horizontal roll, sometimes seemingly irregular, but it is always violent.

Most of the damage in hurricanes comes from these quick severe gusts. The great number of these stormlets was surprising. This hurricane was only predicted to be a grade "B" storm. I can imagine that a grade "AA" hurricane would be a tough place to be in.

The blow lasted until well into the morning of September 10. Then we ran through calm sticky wet air in South Carolina, which was probably the eye of the storm, much enlarged. Toward evening, we met the other side of the whirl near Georgia and the rain once more came down in torrents. It was so black that we could see nothing and the blinding sheets of rain made driving hazardous.

Next day, in Georgia, we met the cold-front of the "high" coming in be-

(*Concluded on page* 398)

Tornado passing by. As soon as we had snapped the first view of the tornado from the front, we made all speed to get out of the locality It was well we did for the storm passed over where we were standing. As soon as we were safe, we took this shot of the twister as it went by.

COLD FRONT. This shows the hurricane clouds broken by the inrushing polar air from the west. The sun is now coming out for the first time in three days. A scene taken in Southern Georgia.

End of the storm. View taken on September 15, 1935, from the causeway across Mobile Bay. This shows the last of the outriders of the third hurricane vanishing to the east. The sky was very blue and the clouds looked like tufts of cotton.

First Regular Airmail Flight

by LIEUT. H. LATANE LEWIS, II

Authentic dope on the controversial subject, "Who flew the first airmail?" In spite of the many claims to priority, by various pilots, we believe that this is the real answer to the problem. An old Jenny, as usual, does the work.

THE world's first regular airmail line was operated by the United States Army back in 1918, when a fleet of old Jennies were pushed back and forth between New York City and Washington, D. C., a distance of two hundred and twenty miles.

It is true that in 1911, Earle Ovington flew special mail for a distance of three or four miles during a period of one week. But that was simply a stunt and was in no sense a regular airmail line. The Army's route was later taken over by the Post Office Department and was the beginning of the great airmail system that we have today.

The planes used were slow, under-powered and usually overloaded, and they operated out of fields that no self-respecting pilot would take a second look at in these times. But those were the days of wooden ships and iron men.

Chief pilot on the line was a handsome youth just out of his teens, Lieutenant James C. Edgerton, who had an unusual knack of finding his way about the sky under any conditions. Today, as he sits at his desk in the Department of Commerce, Edgerton still has a distinctly military bearing in spite of his civilian clothes. He is getting a little gray about the temples, but his eyes light up and a smile constantly tugs at his lips as his memory takes him back to those hectic days of the first aerial postman.

May, fifteenth, was the day that the experiment in mail carrying began. There were impressive ceremonies, political speeches, bouquets of flowers for the flyers, and the President of the United States himself went down to the Polo Grounds and wished the pilot who was to carry the mail to New York, "God speed." Almost as soon as he left the ground the youngster became bewildered, however, and finally came to earth twenty-five miles in exactly the opposite direction.

Better luck was with Jim Edgerton bringing the mail south. He landed on schedule, having averaged about 90 miles per hour on the flight. There was much handshaking and back-slapping and the young lieutenant came in for some of the ennui of a matinee idol.

The second day's mail went through with considerable difficulty. The pilot scheduled to make the flight hopped off from Philadelphia and pointed the blunt nose of his Jennie southward toward Washington. The checkerboard fields and streams sliding beneath his wings soon became a jigsaw puzzle and one that he couldn't piece together. The flyer realized that he was hopelessly lost. He barged around for awhile and finally decided to come down and ask directions.

The pilot is receiving his last minute orders before shoving off with the mail. Once more old Jenny makes history.

With the mail aboard, the pilot proceeds to warm up the OX-5 which animates the Jenny.

Landing on the race track at Bridgeton, New Jersey, forty miles off his course, he became involved with a group of curious horses which cracked up the ship. The mail was sent back to Philadelphia by truck and started out in another plane with another pilot. About thirty miles out his engine began to miss and, as it was getting dark, he turned and high-tailed back to his home field.

Jim Edgerton stepped forward and offered to save the face of the new service and take the mail on to Washington in spite of darkness and a bad engine. Night was coming on in earnest by this time. If his engine should conk on the trip down, there would be no flares for him to release and land by, nor would he be able to bail out with a parachute for this was before the day of the Caterpillar Club. And at Washington he would have no floodlights to illuminate the Polo Grounds. It would mean coming into that narrow field, which was surrounded by tall trees, in utter darkness.

But Jim was an impatient and adventurous young man, so he hopped off without a moment's hestitation. Below him the earth looked like a canopy of black velvet set with diamonds.

Down at Washington there was considerable excitement. Word of the flight had quickly spread and a throng of people, wondering what kind of wild man this was who would pull the whiskers of death so nonchalantly, had gathered to see him break his neck. But Jim Edgerton had a habit of laughing at the morticians all through his eventful flying career. He was the least perturbed of all as he came roaring down from the north and circled the inky pit into which he must bring his ship at the speed of an express train.

There were about half a dozen automobiles parked around the field and Jim estimated his approach from their headlights. Spectators heard his engine stop, then the shrill scream of the wind on his struts and wires. Then they caught sight of a ghost-like silhouette against the night sky, coming down in a dizzy sideslip. An instant later a gray phantom swept across the field and settled down to a perfect landing. The mail had come through!

Edgerton was the first pilot who ever flew into a thunderstorm. Up to that

time, flyers all over the world looked upon electrical storms as a deadly menace and had avoided them as they would a plague. Orders had been issued that no mail pilot should take off if weather conditions were unfavorable.

At Philadelphia, one afternoon during the middle of July, Jim had his ship tuned up and was ready to shove off, but down towards the southwest storm clouds were gathering. It was against orders to fly under such conditions. Jim fumed about the hangars.

Mail flying was no fair weather job, he thought. To be of value it had to go through under all conditions. The motto of the later day pilots, "The mail must go!", was Jim's motto then, too. He gave the order for the mail sacks to be loaded aboard the old Jennie. Mechanics shook their heads apprehensively as he roared down the field and disappeared over the gray horizon.

He dodged the storm as far as possible and then, as he came over the Susquehanna River, he ran smack into it. It was a violent line squall, the storm most dreaded of all by aviators, and the kind that sent the mighty *Akron* and *Shenandoah* down to destruction. On the ground, trees were being uprooted and houses damaged.

"It was the bumpiest ride I ever had, before or since," chuckles Jim Edgerton today, as he recalls the vivid impression it left on him. "We were thrown all over the sky. The rain and hail were so thick that I couldn't see the wingtips. The propeller was all chewed up and I had to throttle down the engine. But," he adds modestly, "I came out right on the course."

And the mail was landed in Washington on time.

That flight, and the others like it that Edgerton made, probably did more than anything else to give the public confidence in the reliability of the airmail. Frequently, he flew through dense fog and relied entirely on the crude instruments of those early days to keep him in the air. On one of these flights he escaped death by as narrow a margin as was ever vouchsafed a pilot.

He shoved off in heavy rain and soon ran into thick weather. He barged on into it, flying blind for awhile and then climbing up on top of the stuff. It was so thick that even the birds had to walk. After about an hour and a half, he decided to try to find the ground to check his course. He was coming down in a fast glide, when suddenly he noticed that just ahead the mist appeared darker than the rest. He yanked the stick back hard and saw the swirling waters of the Chesapeake Bay miss his landing gear by a scant three feet.

It was a close call. Jim swung the nose of his ship around until the compass pointed northwest and hedgehopped along just high enough to clear the houses and trees that shot by under him in rapid succession. Even at that low altitude the fog was so thick it was like being submerged in pea soup, but occasionally there would be a break and

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The Inman Circus Carries a Lion Mascot
by ROLLEY INMAN

Here is the personnel of the Inman Brothers Flying Circus, lion and all. This proves that Col. Roscoe Turner is not the only pilot with a lion mascot. LEFT TO RIGHT. Leona Inman, Melvin Hart, Carl Hall, Ray Jones, Art Inman, Rolley Inman, Margaret Inman (lion tamer) and Scott Griffin.

THE photo shows members of the Inman Brothers Flying Circus, one of the oldest barnstorming troupes in the country. It was organized back in 1923 and is still carrying an average of over 1,200 passengers a week.

This organization has spread the gospel of aviation in city and hamlet from the Canadian border to the Canal Zone. Carrying passengers both day and night out of race-track infields, cow pastures and every kind of difficult field imaginable; using a couple of farm lanterns for boundary lights and a bonfire for floodlights.

Itinerant flyers of this type have come in for more than their share of adverse criticism in regard to safety. But handicapped as the true barnstorming pilot is, by the lack of modern equipment, he more than makes up for it in skill, providing he survives the first stages of his career.

He is the one pioneer who is rarely mentioned in the advancement of aviation, although I dare say that ninety percent. of the air travelers today took their first ride with him; and the number of ground grippers he has inoculated with the flying bug are legion.

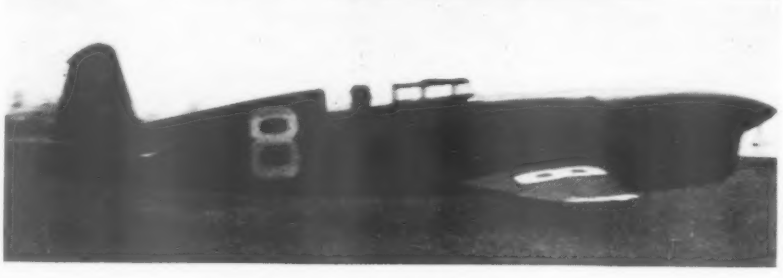
This outfit is justly proud of the fact that in twelve and a half years of continuous flying, they have never injured a passenger in one of their ships. And in order to continue this record they are doing more than knocking on wood.

EDITOR'S NOTE. But what puzzles me is the status of the lion, aeronautically speaking. After carefully perusing Bulletin No. 7, Bureau of Air Commerce, we fail to find any regulations concerning lions. Has the Department slipped up again, we ask?

Winner of the Deutsch Air Races

UPON the request of several readers, we are showing the winning speed plane that gained first place in the third Deutsch Air Race at Beauce, France.

This ship is a Caudron C.460 monoplane powered with a 330 h.p., six-cylinder Renault engine of the in-line air-cooled type. It was flown two laps of 625 miles in four hours, 30 minutes, 17 seconds by the pilot Delmotte. The average speed was 276 m.p.h.



The Caudron C.460 in full flight in races.

"Lone Star" Bill Erwin—Star Ace

by CARL B. OGILVIE

The true story of a master musician who became an outstanding pilot and ace during the World War. A king of the two-seaters who rolled up an enviable record for intrepidity and valor.

Here we have the Pomilio two-seater with its characteristically high radiator and hood. As with many Italian planes, the chord-gap ratio is quite small and exceptionally thin wing sections are employed.

A CONCERT grand piano murmurred and throbbed to life. Music lovers sat enthralled as the short slender young pianist — hardly more than a boy—created a moving aural universe by the magic touch of his fingers on ebony and ivory keys.

Storm-ridden heavens shook the world, rain drenched down and mad winds cried out, only to be driven to their caves when bold sunlight broke through moody clouds to bask green countryside and sea in radiant glory and lulling peace.

The pianist ceased playing. There was a long moment of hushed quiet before the tumultuous applause came. Men and women sat awe-struck, realizing this brilliant student of Godowsky had unfolded to them the rare bud of genius. Chicagoans enthusiastically prophesied that the young musician would become a world-famed concert pianist; guest pianist of the great symphonic orchestras of Chicago, New York, London, Paris, Berlin—the world. Yes, indeed, the whole world would some day know of William P. Erwin, and recognize the spark of greatness glowing in his heart and soul.

In a large sense, the flattering prophesies came true. The name Erwin became known in music centers and throughout the world. But it was not Erwin, the talented musician, they heard of. It was the amazing daring Erwin, fighting observation pilot of the 1st Aero Squadron.

Stories were related of his rhapsodies of victory, caprices of escapes, symphonies of death and disaster the American musician played with joystick, rudder-bar and machine-guns. Berlin, Vienna and Budapest were alarmed over Erwin's skill and marksmanship. He was roundly condemned for not sticking strictly to the duties of flying observer.

"*Der Lieber Gott!* What is this war coming to? That *Amerikaner* kills our flying officers! Richthofen's staffel will kill the *verfluchte schwein!* (insolent pig)."

But the Bloody Baron was dead and the remaining pilots of his staffel tried repeatedly, desperately, and failed to kill —even wound — the American who proved that the touch of his fingers upon joystick and Vickers trigger-trips was as masterly as on piano keys. The war robbed that lad, born in Ryan, Oklahoma, of fame as a musician, but it gave him glory and acclaim as the topnotch Ace—virtuoso-pilot and winged fighter—of the American Observation Squadrons.

"Lone Star" Bill Erwin never minded whether he had pursuit plane protection or not. He rode herd on German observation and pursuit planes. Most of his flights far into Hunland were made unprotected.

He is officially credited with shooting down eight enemy aircraft. He is known to have downed at least four more so far behind the lines they couldn't be verified. He had four planes shot out from under him; was shot down three times—once by an American doughboy who didn't know there were American planes and pilots at the front.

Erwin fought through the fierce fighting of Chateau Thierry, St. Mihiel and the Argonne offensives to return home wearing the gay gallant ribbons of the Distinguished Service Cross with oak leaf cluster and stars and the French Croix de Guerre. He was twice recommended for America's highest award to her heroes—the Medal of Honor.

Indifferent Congress never saw fit to bestow upon America's outstanding observation pilot this singular award. Yet nine years after the war Erwin proved, to a dismayed world, beyond all shadow of doubt that he was of the sterner caliber from which heroes arise. He distinguished himself "conspicuously by gallantry and intrepidity, at the risk of his life, above and beyond the call of duty."

Bill Erwin not only risked his life, but he gave it. Gave it far above and beyond the call of duty. He volunteered and made a futile flight of humanitarianism to rescue participants in the Dole Prize Race lost in the vast reaches of the Pacific Ocean. He never returned from that rescue flight. No other American pilot, who survived the World War, ever

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sacrificed his life more heroically than did Lone Star Bill Erwin.

* * *

ERWIN was far more than just a routine OB pilot taxying observers over enemy territory. He strafed ground-troops, transport-trains and dangerous machine-gun nests. He challenged the best German pilots in the air to deadly combats; protected balloons; flew his wounded observers to first aid; when forced down in No Man's Land he dug in and worked his machine gun, like a doughboy, against German troops intent upon capturing him. Erwin even effected the capture of an entire German battery and its cannoneers. He maneuvered bullet-riddled, shell-torn A.R.'s, Spads and Salmsons as though they were brand new ships just up to the Front from factories. His third ship carried 110 patches over bullet holes—each patch bearing a painted Iron Cross and date death had missed him—before it was finally washed out. Because the squadron was forced to operate far under its required quota of pilots, observers and ships, and because the mechanics were unfamiliar with Salmson engines, Erwin worked far into the night on his troublesome power plant. During daylight hours he made many extra patrols and volunteered for hazardous missions. Always he completed his mission successfully to return and deliver valuable military intelligence to Corps and Army HQ. General Headquarters came to rely upon the fighting Erwin to come through—somehow. He was always flying into the jaws of some dangerous adventure which OB pilots were supposed to sideslip, to limp back from "Hell in Heaven," his plane shell-racked, his observer dead or wounded in a bloody cockpit. So deadly were the battles Erwin engaged in that three of his observers were shot; one of them, Lieutenant Boldt, was killed instantly and the others were seriously wounded. Seven of his official eight victories were observed to have been scraps Erwin deliberately picked. When he was finally cited for the Distinguished Service Cross, the citation gave an account of no less than four daring and valiant acts in the sky, each worthy of the D. S. C.

Actually he had earned the cross four times. He received one medal! Later he was awarded an oak leaf cluster, was three times cited in General Orders and twice recommended for the Medal of Honor.

Lieutenant William P. Erwin reported for duty with the 1st Aero Squadron at Franceville on July 18, 1918. Two days later, before he had got the "feel" of the front, he brushed wings with sudden death to win French acclaim and the Croix de Guerre.

Late that afternoon, with Lieutenant Boldt as his observer, Erwin took off on an infantry liason mission with a French division that had just gone over the top. They kept close contact with the French ground troops. At one place German machine-gun nests held up the advance. Without hesitation Erwin dove down with his Vickers spouting bursts of lead to do the work of attack planes.

His biplane was met by a terrific Boche machine-gun fire from the ground. The plane was riddled by scores of bullets. Boldt was instantly killed when a bullet pierced his head while leaning overside to direct a downward twin-Lewis burst. Alone, Erwin, his gloves and leather coat tattered from enemy lead, carried on. He cleared the path for the infantry advance, machine-gunned the front German trench, fought until his mission was completed.

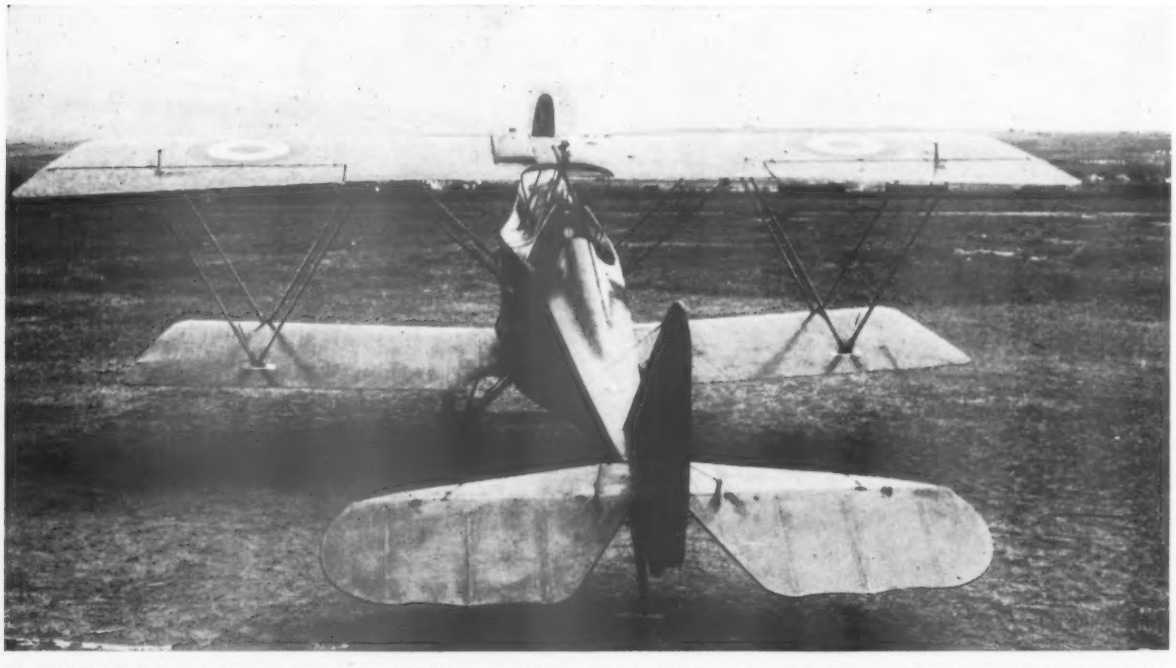
Then he nursed the badly shot-up plane back to the base and taxyed right up to the infirmary door with the dead body of Boldt in the cockpit. The Salmson was a wash out. Erwin sadly cut the fabric from the fuselage at the observer's place. On it was painted the Stars and Stripes insignia of the 1st Aero Squadron. It was wet with Boldt's blood. Erwin kept it as a grim memento that some day he too might shed his life's blood for America's honor.

* * *

ALL was not stark tragedy with Bill Erwin. His most amazing flight and one filled with plenty of hearty laughs for American airmen and doughboys, was Erwin's "capture" of a German field artillery battery on Sept. 12, 1918. No other pilot of the World War ever accomplished such a seemingly impossible thing.

Bill Erwin had teamed up with Lieutenant Byrne V. Baucom, a Milford, Texas, lad, as his "sand bag." Together they had made a big name for themselves at Chateau-Thierry and the St. Mihiel sectors. They had flown through the worst weather conditions imaginable, courageously facing the hazards of crashing from pea-soup visibility and carried out missions in the face of heavy odds. Frequently they went down within fifty feet of the ground behind the Boche lines, machine guns yammering to disorganize enemy troops.

September 12, was an eventful day for the Oklahoma pilot and Texan half-wing.



The Italian single-seater, the S. V. A. 5, a speedy little scout with an unusual biplane wing construction. The interplane bracing is of the Warren "Zig-Zag" type, employed because it eliminated the necessity for stay-wires and thereby hastened assembly.

"Lone Star" Bill and "Battling" Baucom repeated their low altitude strafing stunt. At noon, while on patrol, they saw a Hun sneak up and destroy an American sausage balloon. Erwin immediately gave chase to the Boche who was headed for a second American bag. Having the advantage of altitude, Erwin nosed his ship down in a dive. He took the pilot so by surprise that the Americans were able to finish him off within sight of the two balloons' crews.

That same memorable day, Erwin and Baucom discovered a German battery making hasty preparations to retreat in the face of advancing American troops. Spiraling down they gave the Huns "the works." Two yellow-spined Boche officers made frantic dashes to desert their frightened cannoneers and get safely away from the American airmen's bullets.

One officer was shot dead by Erwin as he galloped away on his horse, while Baucom shot the horse out from under a pale-faced *Unter-leutnant*. By now the German batterymen were so completely panic stricken that, when they dove into fox holes, their terror was laughable to the American airmen. Circling overhead the Yanks let loose a burst every time a German skuttle helmet crawled into sight from a dugout. Thus, the Huns were "held captives" until the American infantry arrived and took them prisoners.

During the later half of September, the bulk of the American Army was transferred from the St. Mihiel salient to the Argonne for the serious task of attacking the enemy's line from the Argonne to the Meuse, a line vitally important for the Germans to hold at all cost. Here Erwin's victories and courage were to mount to new heights. From Oct. 6th to 24th he shot down and received official confirmation for seven German planes. He shot down others 30 to 40 miles behind the lines which could never be confirmed.

Despite almost constant rain and treacherous fogs that blinded the air trails during that historic month, Erwin carried out many long reconnaissance flights. His life was in constant danger. The German High Command issued orders that American planes were to be downed at all cost. American casualties in men and ships grew heavy. American Army HQ cautioned OB pilots to complete their missions and hi-tail back. They were not to fight. Fighting was to be done by protecting pursuit pilots. But frequently there was no "upstairs" coverage. *Erwin fought!*

They tell of an appeal from American Divisional Headquarters. The infantry's advance position was unknown. All wires had been blown to bits, runners were dead, wounded or lost, the radio had failed to function properly. Could the 1st Aero Squadron locate the American front lines so that it could be given artillery support? Clouds hung low; it was late in the day—near dusk. The Squadron CO said he could not ask any of his men to risk their lives in such a hazardous undertaking. Erwin overhead, volunteered.

He was advised by squadron pilots not to risk the flight. But he took off at dusk with only his compass, his altimeter and occasional flares to guide him and hedge hopped beneath the clouds, barely skimming over tree-tops. He located the "lost" infantry, returned. Division had his report within an hour after its frantic appeal for help. That was Bill Erwin.

This agile smiling pilot of 23, became famous for a new method of observation. After completion of the morning patrol Erwin would take off for an extra patrol alone. He'd fly directly in advance of the American infantry at low altitude, braving German ground fire, to return and drop messages to the front line Yanks telling them the location of enemy machine-gun nests. These flights he called "cavalry reconnaissance"; it was suggested Erwin should get a horse and join the cavalry since he was doing its scouting work. It was then he was named "Lone Star Bill."

An idea of how the Germans pounced on American OB's can be gleamed from Erwin's report of a flight from Exermont to Varennes, France, on Oct. 8th. Erwin, with Lieutenant Arthur E. Easterbrook, observer, engaged in five different combats during that one reconnaissance to locate American troops. The Yank airmen gave the following account of themselves:

"During encounters broke up a formation of 3 planes, sending one down out of control; killed or wounded an observer in another encounter, sent down a biplane, it crashed; drove off a two-plane formation and several times single machines."

For this extraordinary heroism, in successfully completing the mission against overwhelming odds, Easterbrook was awarded an oakleaf cluster. Erwin was mentioned in General Orders.

On Oct. 15th, Erwin was sent over the lines on a new type of patrol. Instead of an observer in the rear cockpit he carried several hundred pounds of printed literature. This was one of the first prop-

This is an excellent shot of the Farman "Short-horn," a French pusher-type biplane that was employed during the first months of the World War. This is distinguished from the Farman "Long-horn" with its forwardly projecting structural members.

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aganda expeditions sent over Hun territory to drop leaflets describing in glowing terms the scrumptious bill-of-fare and other advantages of American prison camps, to encourage wholesale desertion from the Kaiser's forces.

Erwin, bored from the lack of prospects for excitement, quickly dumped his cargo and went on his own in search of a scrap. He flew directly to a Hun airdrome, but no planes were in the air and none came up.

Streaking for the trenches Erwin spotted a Rumpler at 1,000 meters. He jockeyed into position above the Hun two-seater and came down with machine guns roaring before the Rumpler's men were wised up that sure death was riding their tail.

At the first burst Erwin saw the Hun observer slump down in his plane. The Rumpler pilot was game to the core, of equal courage and as gallant as Erwin. They fought a tight spiraling battle, both shooting hard and maneuvering skillfully for an advantage. Erwin made a daring final thrust. Diving in at point blank range his machine gun spat a single bullet. The German clutched at his chest. The plane spun to earth and crashed.

Erwin celebrated his birthday at the front by getting a flamer. Taunting a German Fokker pilot to dive on the heavier, slower observation plane, Erwin did a half roll and came down on the Fokker as its pilot overshot his mark. A burst from "Lone Star" Bill's gun sent the Fokker down in flames. Then Erwin got a big surprise.

The Hun pilot stood up in his cockpit, waved to Erwin, and leaped out into space. A few seconds later a white mushroom rose from the German's shoulders. He was escaping death by a parachute. Erwin did not possess the ruthless heart that some German pilots displayed when they followed American balloon observers down to shoot them as they dropped from burning balloons with 'chutes.

He circled, watching with interest the German's safe descent behind the American lines. That evening, at Corps HQ, Erwin visited the pilot who had been taken prisoner and received the German's parachute as a trophy and birthday present.

The same night, at a French estaminet, during a party in Erwin's honor, he eyed longingly an old piano. Its ivory keys, yellowed by age, seemed to taunt him with these questions: "Are you a musician? Can you still play? Are you afraid to try?" Erwin went to the old instrument. The piano was caressed into life and the eating place swelled with pleasant, tuneful sounds. The joymakers listened in hypnotic wonder at the beautiful melodies that came from the touch of a man's fingers calloused from handling joystick, tools, bullets and machine guns.

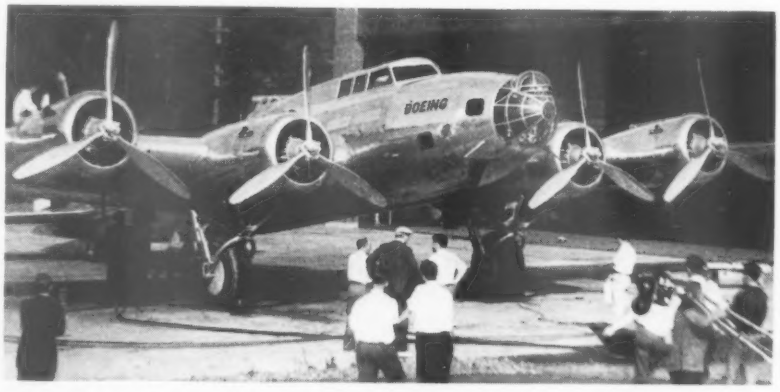
Unconscious of those about him, Erwin played on. Once more he was back in Chicago playing, surrounded by a group of beautiful women in gorgeously fashioned gowns and men in formal black and

(*Concluded on page 392*)

More About the Boeing "299" Bomber

The Boeing Bomber "299" on its trial flight when it showed unusual speed, climb and maneuverability. This was taken just after take-off so that the wheels are not yet retracted. The general outlines of the bomber greatly resemble the Boeing "247-D" passenger transport plane.

View taken full head-on, showing the tremendous wing-span of the Boeing Bomber "299" and the line-up of the four wing engines. The four engines are automatically synchronized so that all of them are equally loaded. This device has only been recently developed by the Pratt & Whitney Company.



Front end close-up of the bomber showing how the engine nacelles are faired into the wings and also the four adjustable pitch three-blade propellers. Note the excellent visibility through the cage in the end of the nose. The landing-wheels retract into the two inside engine nacelles.

ON her first flight, the Boeing "299" bomber performed so well that she exceeded all expectations. Further trials, with attendant tune-ups, have shown still better performances in speed, climb and maneuverability.

While rated at about 250 miles per hour, it is rumored that the top speed is about 272 miles per hour. These are not the official figures but are estimates by civilian observers "outside the fence". According to one of our correspondents, "she climbs like a balloon". Whether this was her empty vertical ascent or loaded, is not known.

However, it would seem that something ought to happen with approximately 3,000 horsepower aboard and with a model close to another plane of very nearly the same physical characteristics. The similar plane, is the Boeing "247-D" passenger transport.

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More Dope on the Gates Circus

by BILL ROHDE

This is the second article in a series concerning the Gates Flying Circus, its personnel and activities. The author was a mechanic with this most interesting of the early flying circuses. The first article appeared in the October issue

SYNOPSIS OF FIRST ARTICLE. After getting his discharge from the army, after the war, Clyde E. Pangborn began his career as a barnstormer by joining the Northwest Aircraft Company. This engagement lasted less than a month and was terminated by the crashing of the decrepit Jenny that Pangborn was flying.

On his return to his home town, Pang became a promoter, and with the assistance of A. B. Annis, local banker and druggist, the sum of $5000 was raised for a new exhibition company headed by Pangborn. With a friend, Ralph Reid, he rigged up a Jenny, purchased with the company funds, and opened the first exhibition at Wallace, Idaho. They flew a number of engagements, but because of numerous minor crackups, they made no money.

The nose of an old Jenny, originally designed as a primary trainer but later used for every purpose under the sun and the particular pet of the early barnstormers.

ANNIS, one of the stockholders of the new aviation company, became airbitten, and joined the boys in Woodland.

Pang and Annis took a train for San Diego and Reid flew the plane down.

They nonchalantly registered at the best hotel in "Diego." A week later they suddenly checked out for a cheap room at the Y.M.C.A. Jimmy Hennessey was the only other commercial operator in San Diego that winter. Both were asking ten dollars a head for passengers. Neither party was fairing very well.

The California public was becoming sophisticated. They had seen planes before and flyers were having difficulty getting them out to the field. The only way was to provide exhibitions of some sort. San Diego had not seen wing-walking. After a heavy discussion, it was voted that Pang be the wing-walker. San Diego forced wing-walking on them. Some of the stunts were to hang by the knees from the undercarriage, handstand on the top wing, walk erect on the top wing and hang from the wingtips.

Among those who saw Pang walk wings was the Prince of Wales. A celebration was being given in his honor. The prince witnessed the wing-walking show in spite of the fact that Governor Stevens was making a speech. The governor was sore as hell. Pang and Reid were not on the reception committee.

Omar Locklear made the first plane change in history in Texas. Milton (Skeeter) Elliot, Frank Clark, Al Wilson and then Pangborn followed suit.

Locklear, according to reports, had attempted to change from an automobile to an airplane and had failed. Pangborn figured he could do that stunt himself and confided to Reid. He flew to Los Angeles to interest the Cole Motor Car Company in the idea but they had backed Locklear, and as he failed, they weren't interested in any more futile attempts. Undiscouraged, Pang ran across Al Lambla, a garage man, with the fastest car in Los Angeles, an old Lozier used for towing.

Pang persuaded Lambla on the plea of publicity he would receive, to join them. This was in May, 1920.

They built a special brace on the back of the car to which Pang could cling. A rope-ladder was dangled from the Jenny. Reid flew the Jenny and Lambla drove the car. Pang and Lambla drove down Coronado Beach at 60 miles per hour, Reid lowered the Jenny and came down over the car. Pang grabbed the ladder, climbed up and thus was the first man to make an auto-to-plane change in history.

They were ready to capitalize on the stunt. They plastered Los Angeles with announcements. The newspapers gave them generous space, even the placards on trolleys carried the news.

Most of San Diego came out to Coronado Beach on Sunday, May 16, 1920, to see the auto-to-plane change for the second time. Lambla, with his famous horseshoe mustache waving in the wind and Pang again streaked down Coronado Beach. Reid dived the Jenny up behind them. On the first and second attempts, Pang missed the ladder. The third trial and last (the crowd was get-

Here's old Jenny again, out in the hayfields but still able to navigate.

4

ting restless) they resolved would have to be a success. Once again they lined up for the try. Lambla hurtled the Lozier over the sand at 60 miles an hour. Reid came in from behind. Lambla turned for a fleeting glimpse, saw a plane traveling much slower and at considerable altitude and for a moment took his foot off the accelerator.

The plane he saw was an old Aeromarine 39b flown by J. O. Eychaner, and whom he thought to be Reid. Ralph in the meantime came in at 70 miles an hour as the car quickly lost speed. There was a vast difference in the speeds of the two vehicles. Pang grabbed the ladder and for one short moment hung on, then as the slack came out of the ladder, he was jerked severely off the car. His arms were nearly torn from their sockets. The ladder slid through his hands and he was flung ahead of the speeding auto which swerved just in time.

Pang struck the sand, bounced six feet and rolled forty, unfolding himself and staggering into the arms of Bob Morgan, a photographer, who had caught action pictures of the accident. Women screamed and fainted, the crowd thought he was dead. He was loaded into a car and rushed to the hospital.

He had collected a split breastbone, broken shoulder, dislocation of left hip, left wrist broken, several bent vertebrae, and lacerations and abrasions of the face and body. While they were working on him, a friend rushed in saying that Eychaner had crashed into a bathhouse.

The newspapers became excited and condemned foolhardy stunts. The San Diego Sun burst forth on its front pages with an editorial condemning *"exhibition flying as that performed at Coronado Beach on Sunday."*

This was the first unfavorable report Pang had ever received. All he was doing was earning his daily bread and when he felt better he lost no time in telling San Diego he enjoyed earning his meals in this manner. Al Wilson came down from Los Angeles and joined the boys in the conflict, by doing hornpipes on the top wing, by hanging from the wing tips by one hand and by making a plane change. Tiny Broadwich III, a woman parachute jumper, also made several jumps from Pang's Jenny to illustrate as forcefully as possible her contempt for old washwomen who wrote editorials.

A short time after Pang's recovery, Reid left him to promote a job as pilot on a new postoffice route between St. Louis and Chicago. Annis also had decided that St. Maries needed more of his attention that did aeronautics.

Aviation was beginning to hit its stride in California in 1920. Bill Morris and Sam Purcell were operating at San Francisco. Earl Dougherty and Bud Creeth were at Long Beach. Leo Dawson and Eddie Rickenbacker, both war aces, were in Oakland operating Durant Field and teaching Cliff Durant, the auto racer to fly. Cecil B. DeMille's Field

(*Continued on page* 390)

The New Curtiss O3C-1 Navy Scout Observation Planes

Front elevation of the Curtiss O3C-1 Navy Scout biplane to be used as scout observation ships.

THE U. S. Navy recently purchased 135 Curtiss O3C-1 scout observation planes for the Bureau of Aeronautics for which a total of $2,752,702.00 was paid, including the cost of spare parts. This is one of the largest orders placed for airplanes in this country since the World War.

These planes are variously provided with landing-gear for take-offs from the decks of aircraft carriers, with pontoons and also with arrangements for being catapulted from battleships and cruisers. As will be noted, they are equipped with wing-slots and flaps for slow landings and quick take-offs.

No information has yet been released by the Navy Department on their performance, but it is said by observers that they appear to be the fastest and most maneuverable ships of their class yet delivered to the U. S. Navy. That this is true seems evident from the great number of planes ordered.

The French Potez Lightplane for Private Owners

FRANCE is rapidly growing lightplane-minded to judge from the numerous French lightplanes now on the market and under development. And one of the most celebrated of the new lightplanes is the Potez "60" shown by the accompanying photograph. It is said that more than one hundred of these planes have recently been put into service by the lightplane clubs of France for training and pleasure hopping.

This pleasant looking little parasol monoplane is a two-seater of wood construction, powered with a 65 h.p. Potez aircooled three-cylinder engine. It is sold for francs 28,000, or approximately $1,865. However, the French Air Ministry pays a premium of francs 10,000 on each ship purchased so that the cost to the owner is only $1,200. It is greatly to be desired that our own government follow this plan instead of throwing away money on various other silly projects.

The wing-span is 33 feet and the length is 22 feet, 8 inches. It is said to develop a top speed of 94 m.p.h. and climbs to a height of 3,280 feet in 7 minutes, 30 seconds. It has a total range of 450 miles at its normal total weight of 1,200 pounds. The service ceiling is 11,500 feet, which is very good performance for the amount of power installed.

Well, here's hoping that our own government will finance a few planes like this for private owners. Probably it will, when the initials are decided upon, the PAO or the BVD.

Front view of the new Potez "60" parasol type lightplane is a very neat looking job. It is favored by many of the French Air Clubs for training.

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RCA Stages Radio Exhibit

Showing the latest models of transmitting and receiving apparatus for aviation. A diagram shows a typical method of installing the system on a plane.

THE RADIO CORPORATION OF AMERICA (RCA) has established a most interesting and instructive exhibit of aircraft and airport radio equipment at the Camden Central Airport, Camden, N. J. And in connection with this working exhibit is a complete service department for servicing radio equipment.

Simultaneously, with the opening of RCA's aviation radio headquarters building, the introduction of a most complete and advanced assortment of aircraft radio apparatus was announced. Outstanding among the new instruments is an extremely compact, lightweight and low-cost receiver which should prove especially attractive to sportsman pilots. It is available in two wave-band reception combinations, either to receive the beacon and entertainment bands (AVR-7), or the beacon and communications bands (AVR-7A).

Either receiver is a highly efficient superheterodyne unit equipped with four multi-function tubes giving the equivalent of six-tube performance with a resultant lower primary power drain. The receiver cases, with built-in "B" and "C" power supply units, measures only 8¾" by 6¾" by 9⅛" and weighs only 16 lbs., 10 oz.

They are remotely controlled by mechanical cable from a unit which fits easily into the small unused spaces on the instrument panel. It requires only standard aircraft dry cells or storage batteries for its low economical current drain. Ease of operation, ruggedness of construction and simplicity of installation are some of the many features to recommend the new receivers.

There is also a new aircraft transmitter (AVT-3A), of 20 watts power output and weighing only thirty-eight pounds, which is described as a "single package" equipment of exceptional capabilities. It is a small single-unit transmitter especially designed and constructed to meet the severe requirements of aircraft communications. During flight, it offers the pilot a choice of three types of high-quality emission including telephone, continuous-wave-telegraph (CW), and tone modulated continuous-wave-telegraph (MCW)—assuring reliable and efficient communication with ground stations in all kinds of weather and under all operating conditions.

Display of various types of aircraft communication systems and controls made by the RCA at Camden Central Airport. Both transmitters and receivers are shown in practical operation.

The new compact light-weight single-unit aircraft radio transmitter (RCA AVT-3A) developed by the RCA laboratories.

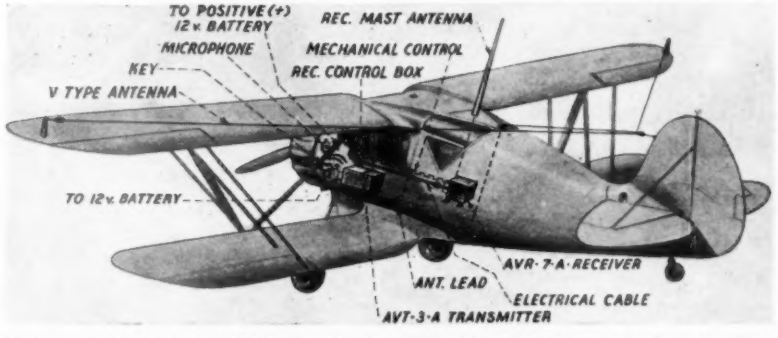

Diagram showing a typical RCA aircraft radio system on a cabin plane with all parts named. This is a two-way system suitable for both private and commercial airway operators. Note the relative location of the receiver and transmitter within the ship.

The entire equipment, including dynamotor supply, is housed in a single, durable, metal case measuring only 10½" by 10" by 16⅜". Reception is provided in the frequency range of from 2000 to 6500 kilocycles and a simple switching arrangement permits rapid selection while in flight of any of three pre-determined frequency channels within this range. Power is supplied by a standard 12-volt storage battery or other direct-current source. Accessibility to the chassis is provided by an ingenious mechanical arrangement by which the entire chassis slides out for inspection.

Included in the newly developed RCA aviation radio apparatus are a complete and impressive variety of airport communication instruments. Provision against rapid obsolescene is one of the many ingenious engineering features of the equipment, Mr. Little said. For instance, an airport starting with one of the lower powered communication transmitters can add additional power, and provide for speech amplification systems and radio-beacon service, by adding other apparatus especially engineered for adaptation, and using the original transmitter as a foundation.

This gives the plane owner and the airport management a very adaptable series of combinations from which to make a selection. Flexibility is sometimes important.

In addition to the ruggedness, ease of operation and adaptability which the airport manager should expect from present-day advanced aircraft radio design and construction, the new RCA apparatus represent a marked improvement in appearance. Trim, smart lines and two-toned finish serve a decorative as well as utilitarian purpose.

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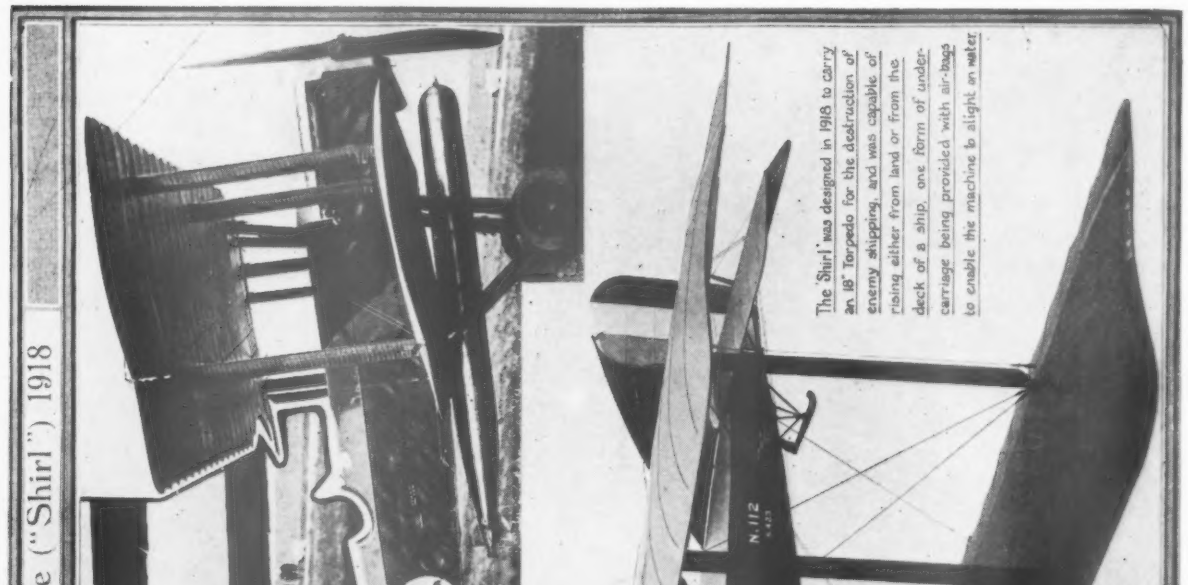
A Page of Warplane Photos

These photos are a well worth while addition to the files of our Photo Phans collections, covering as they do, certain English planes that have not received much attention.


SHORT 375 h.p. Torpedo Aeroplane ("Shirl") 1918
The 'Shirl' was designed in 1918 to carry an 18" Torpedo for the destruction of enemy shipping, and was capable of rising either from land or from the deck of a ship, one form of under-carriage being provided with air-bags to enable the machine to alight on water
N.112
SHORT 375 h.p. (Rolls-Royce) Torpedo Aeroplane - 'Shirl' - fitted with commercial Mail Carrier in lieu of Torpedo.

An Audible Speed Indicator

by HERBERT L. PROUT

Describing some novel experiments made by the author with a new instrument designed by him. This scheme presents some valuable pointers to the lightplane pilot.

THE one thing of supreme importance in flying is to maintain flying speed, for once flying speed is lost, control is lost and the plane becomes in effect a "run-away horse."

Always the nose goes down and it begins a precipitous plunge toward the earth. This plunge as a rule is further complicated by a twisting or spiral movement known as a "spin."

Ordinarily, when sufficient downward speed has been attained, control may be regained; but if the beginning of this spin takes place within two or three hundred feet of the ground the chances are that contact with the earth, with its disastrous consequences, will result before complete recovery can be attained.

All pilots understand this perfectly, and the first instruction a student ever receives is to always maintain flying speed. Yet, strange as it may seem, while the cockpit of a plane is equipped with all manner of instruments, there is no instrument to warn the pilot that he is losing flying speed, or approaching a stall.

We have the altimeter to indicate the height above the ground, the bank and turn indicator, the climb indicator and the airspeed indicator which, of course, would give warning of an impending stall provided it is watched continually, but the accidental stall as a rule occurs when the pilot's attention is diverted elsewhere than the instrument panel.

In addition to all these instruments we have a complete set for the engine, the tachometer to show its R.P.M., the oil pressure gage, the oil temperature gage and also the compass to hold the plane on its course. These instruments are all considered quite necessary and though some are very expensive, they are regular equipment on most planes. Yet nothing is ever provided to give warning of the treacherous condition which is responsible for three-fourths of all serious airplane accidents.

Every year dozens of very good flyers succumb to this treacherous stall and spin. In a moment of carelessness they are caught off guard and, doubtless to their own great surprise and consternation, find their plane has gone out of control and they have not sufficient altitude to recover. With an instrument to shout its warning in time, the story might have been different.

The nearest approach to such an instrument which the writer has seen is furnished as regular equipment on his own plane, the "Curtiss-Wright Jr." This instrument is simplicity itself, and consists of a wind vane which stands in a vertical position just in front of the windshield, being held upright by a spring, but is bent backward by the force of the wind according to the speed of the plane.

The author's Curtiss-Wright Junior equipped with the new indicator which can be seen projecting from the nose of the ship.

This in turn is indicated on the instrument panel by a pointer which moves downward as the speed of the plane increases. Flying speed is indicated on a white background but when stalling speed is approached the pointer goes into the red. This instrument is far easier to read at a glance than is the dial of the usual airspeed indicator.

Unfortunately, this instrument cannot be easily adapted to other planes for the reason that the propeller blast would destroy its accuracy, whereas, the Curtiss-Wright, being a pusher-plane with the propeller behind, the slipstream has no effect whatever upon it.

This instrument is so useful that, having once become accustomed to its use, one wonders how pilots in other planes manage to get along without it.

For example, on the take-off, it shows when to begin the climb, and just how steep a climb may safely be made, especially in the climbing turn, which is always a rather hazardous maneuver. On a day of poor visibility when the horizon cannot be seen, or when flying through a cloud, it gives a very sensitive check on the attitude of the ship, whether ascending or descending, for if the motor speed is constant, any change in the flying attitude of the plane is accompanied by a change in air speed.

In making turns or steep banks, one constantly refers to it as a check on his speed, for more speed is required on a turn than in straight flight; especially is this true in gliding turns. In making long glides with the engine off it is useful in adjusting the ship to the most efficient gliding angle; especially is this true when the horizon is not visible.

When coming in for a landing it aids the pilot in adjusting his speed to a safe minimum. When coming in low over an obstruction it is a positive check whether one has sufficient speed to clear the object without danger of settling.

The writer formerly flew an American Eagle biplane of the conventional type, and in this plane some idea of the speed when coming in on a glide could be had from the whistling of the wires; but in a cabin plane, or a monoplane without external wire bracing, this whistling is entirely lacking, and the pilot's knowledge of his speed is mostly guesswork.

And here we come to the crux of the whole matter, the purpose of this article. If the whistling of the wires serves the very useful purpose of indicating the speed of the plane, why cannot all planes be equipped with an instrument which would whistle continuously while the plane had flying speed, changing its note according to the speed of the plane, and going out entirely just before stalling speed is reached.

This audible speed indicator would have the very great advantage of keeping the pilot informed at all times as to his speed without necessitating his continual dodging into the cockpit to scrutinize an instrument board. There is enough for the pilot's eyes to watch outside of the cockpit.

Why not let the ears keep him informed at all times if he has a sufficient margin of flying speed? A whistling note has another advantage, that it can be easily heard above the noise of the motor, as it has a very penetrating quality. The exact form of the instrument requires some ingenuity and experiment to work out, but it can be done.

The windshield of the writer's car, when open in a certain position, whistles in this very way, changing its note

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according to the speed of the car. And we all know how a high wind will whistle or howl around a building, changing its note with the velocity. Another variation of this instrument would be a siren such as boys have on their bicycles and which could be driven by a small windmill.

About two years ago the writer wrote a letter outlining this idea to the "Aeronautical Patents and Design Board," and suggested that experiments be undertaken to develop such an instrument. We received a gentle slap on the wrist for our trouble. We were told by that august body that the idea was neither new nor useful; that a good pilot could "feel" an approaching stall without any warning device, and the conventional speed indicator was all that was needed.

The reasoning seems to be that no red light should be put at a railroad crossing for the reason that a good driver will always stop and look both ways anyway; therefore a red light is superfluous. Let us grant for a moment that a "good" pilot can "feel" an approaching stall.

Is that any reason why those of us who are not so "good" should be denied an instrument which positively will give warning of a loss of speed in time to make correction, even though our "feeling" or "guessing" apparatus is not working 100 percent. efficient.

We know from actual experience that the stall indicating device on the Curtiss-Wright Jr. is an extremely useful and practical device, even though it has to be watched. It is unfortunate that it cannot be applied to other planes because of the propeller blast. We have also used the familiar indicating device which is often clamped to a wing strut of a biplane, and though it works on the same principle, there is simply no comparison between them; the latter is too hard to read and too inconvenient to look at.

However, the whistling device described above could be adapted to any plane by leading the air stream into the cockpit by means of a funnel and tube, or by clamping the instrument itself out on the wing. Think of the immense help it would be to a pilot to have his exact speed transmitted to him every instant while going through a difficult maneuver, by means of the changing note of a whistle.

This is more or less along the same line as the speed-trap devices once applied to automobiles as a warning when the car exceeded the legal speed limits. An air-blast siren mounted at the front of the car, started to blow at the then top traffic speed limits of 25 miles per hour so that the officer on the corner and all others who chose to hear, were appraised of the speed violation.

We are convinced the time will come when this instrument will be considered the most indispensable piece of equipment on every airplane. And the persons or company who first perfect and market same will reap the financial benefits.

Crash—Bang—Boom!

A section of a Fox Movietone release showing F. F. Frakes doing his celebrated plane crashing stunt. This picture, taken at the instant of impact, shows that this is no fake.

Notes on Fuel Injection

FUEL induction having offered gratifying performance during combat and tactical maneuvers, continued experiments ensued toward possibility of reduced fuel consumption and increased power production. Once more the fuel injection system has proved superior to conventional carburetion, revealing fuel economy of nearly 10 per cent and increased power operation amounting to approximately 12 per cent.

The gain in power is due principally to an increase in air consumption brought about by eliminating the pressure drop through the air heater, carbureter and hot spot. Additional power is also attributed to more complete combustion and better vaporization of the charge.

In addition to the desirable combination of increased power and fuel conservation, among various other advantages of fuel injection is the elimination of ice formation in the induction system which, in turn, makes pre-heaters, jacketing and hot spots unnecessary.

Other important features are improved starting, smoother idling and simplified acceleration. Perfect fuel distribution, as effected by the injector, permits successful management of combat and pursuit planes in any position, whether inverted, horizontal or vertical, thus adding a valuable safety factor to reduce hazards in emergencies.

Despite the inestimable value of the numerous improvements recounted it is believed that the fuel induction system as opposed to carburetion installation, affords possibility of an even greater scope of accomplishment. Possible use of a bi-fuel system is seriously contemplated, tests having been completed with alcohol and water, also, gasoline and water, in an effort to obtain more advanced performance than is offered by present service fuels. Favorable results have led to the discovery that a 6 per cent addition of water to gasoline produces an appreciable power increase without reaching detonation and pre-ignition limits. Continued experiments disclosed that as much as 36 per cent of water may be added to gasoline before power interference is noted.

"Wind-News"

WE are in receipt of the interesting and valuable pamphlet, "Wind News," together with a copy of the latest issue of the new instrument catalogue issued by Julien P. Friez & Sons, Inc., Baltimore St. and Central Ave., Baltimore, Md., meteorological instrument makers.

A very fine listing of weather instruments is shown, instruments for measuring the velocity and direction of the wind, in all classes. This catalogue, and the copy of "Wind News" that accompanies it, should be of interest to all airports, aviation clubs and similar organizations where weather observations are of importance.

Pat Phrases Used in Aviation

by J. H. MEYER

Call it slang, call it cant, call it what you will, aviation is building up a language of its own as is so often the case in any highly specialized industry. But remember— what is slang today is an integral part of our language tomorrow.

AT EVERY airport in the United States, we come face-to-face with many expressions and phrases that are incomprehensible to the laymen but which afford a short pat and convenient means of expression among airmen and air women.

This may be called "slang" by straight-laced precise philos, but be that as it may, any legitimate language is the outgrowth of colloquisms such as these pat phrases. What is slang today is often an accepted part of our language tomorrow as we will easily discover after an examination of a very recent edition of a dictionary. The automobile, radio and airplane have all contributed extensively to our modern language.

In compiling the following list of aviation terms and expressions, no attempt has been made at listing technical words or accepted scientific phrases. Here you will find only the words applying to everyday operation, field work or shop routine—short pat words such as originate with the pilots and mechanics.

DICTIONARY

(A)

A.B.C. (1) The first flying instructions to a student. (2) A student permit issued by the government.

ACE. More properly a World-War pilot with a record of five or more victories, but also often an expression meaning supremacy in some branch of aviation.

ADMAN. A pilot flying advertising devices such as banners or doing similar advertising work with a plane.

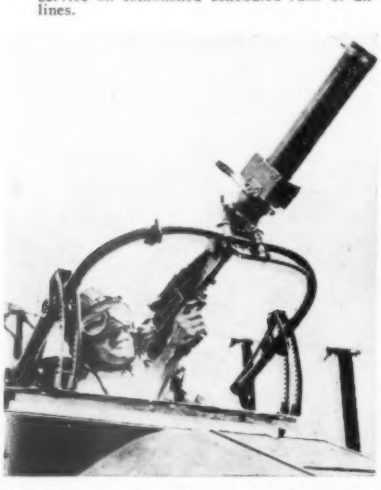
AEROBATICS. Trick or stunt flying. Derived from acrobatics.

AIR-BUGS. Aviation enthusiasts.

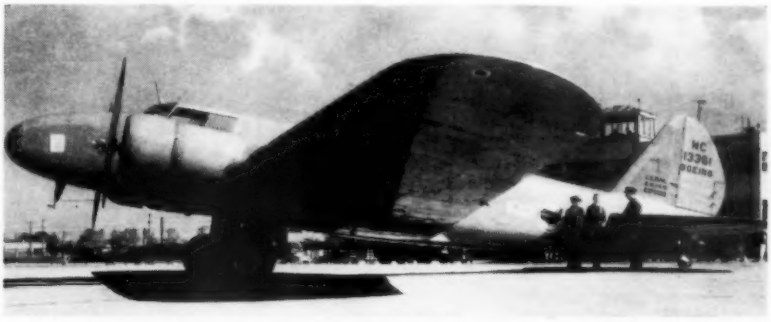
AIR-BUMPS. Rough bumpy flying conditions due to vertical air-currents set up by the sun's heat.

AIR-HOLES. Bumpy air-currents set up by the sun's heat that frequently allow the plane to drop suddenly as if it had fallen into a hole.

AIRLINER. Aircraft employed for commercial service on established scheduled runs or airlines.



This is the "sand-bag" or observer in the rear cockpit of a two-seater bomber or observation ship.



A metal transport plane is a "TIN-GOOSE", a name first applied to the old Ford Trimotors. Nothing, however, is said about the gander.

AIRSPEED. The speed of aircraft in relation to the air and not necessarily the speed in respect to the ground.

AIRWORTHY. Aircraft fit and safe for flight.

AIRWORTHINESS CERTIFICATE. A paper issued by the government after the official flight tests are made, attesting that the aircraft is safe according to standard regulations.

AMMO. Ammunition.

AMPS. Amperes or rate of flow of electrical current.

ANGELS SINGING. A close escape from death.

ANTICLOCK. Rotation in a left-hand direction or opposite to the direction of clock hands.

APRON. A concrete road placed in front of the hangars.

AQUADAG. A mixture of fine graphite and water.

ARCHIE. An anti-aircraft gun or battery (artillery) located on the ground for defense against aircraft.

ARM-CHAIR PILOT. A non-flying person with ideas based entirely upon theoretical principles.

A.T.C. Abbreviation for APPROVED TYPE CERTIFICATE, a permit issued by the government approving the design and construction of aircraft and a permit for building the craft.

ATMOS. Abbreviation for ATMOSPHERE, a unit pressure of 14.7 pounds per square inch. Used more in Europe than in U.S.A., but often appearing on imported aircraft or engines.

ATMOSPHERICS. Interference with radio reception by noises created by atmospheric electricity. Also known as STATIC.

AUTOMAT. An automatic device for controlling the direction, flight path or altitude of aircraft. It is also known as an "automatic pilot," a "robot pilot," etc., since it takes the place of the pilot in maintaining the proper flying altitude and direction.

(B)

B.A.C. Abbreviation for the BUREAU OF AIR COMMERCE, a branch of the U. S. Department of Commerce devoted to the regulation and control of flying in the United States.

BAG. A balloon or gas-filled aerostat.

BAIL-OUT. To jump to safety from a distabled aircraft with a parachute.

BALLOON. To ascend or climb rapidly with an airplane.

BALLOONATIC. A person having an enthusiastic interest in ballooning or balloons.

BANK. To tilt the wings of an airplane at an angle with the horizon when making a turn to offset centrifugal force and thus to prevent skidding.

BANNER TOWING. To drag or tow an advertising banner after an aircraft.

BARNSTORMER. A free-lance pilot, without a fixed base of operations, who roams about the the country "picking up odd jobs."

BARNSTORMING. To rove about the country with a plane, carrying passengers, doing stunt flying, giving exhibitions, etc. A free-lancing tour with a plane.

BARREL. The cylinder structure or the head and walls of an engine cylinder.

BARREL-ROLL. A flying stunt in which the wings of the plane are rotated about the horizontal flight line along which the plane is traveling.

BAY. The space between the struts of a biplane or the space included between the struts.

Be°. Abbreviation of the "Degrees Baume," a density unit employed in the measurement of gasoline, lubricating oil or other fluids.

BEACON. A marking light or a radio station employed for the guidance of aircraft.

BEAM (RADIO). A straight ray or path, consisting of radio waves and employed for guiding aircraft along a defined path or lane. Aircraft in flying along the beam are enabled to fly accurately between two points at night or without visibility.

BEAM (RIDING THE). Traveling along a radio beam.

BEARING. The direction taken by aircraft in flight, measured by a compass.

BLADE. One member of a propeller assembly. The radial member that engages the air.

BLAST. To race or speed up engine excessively by quickly opening the throttle.

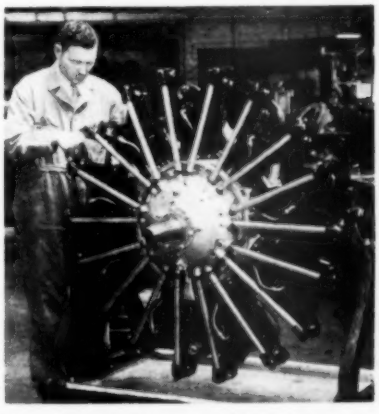
BLEED. To drain out a fluid.

BLIMP. A small airship or dirigible of the non-rigid type. It is simply a power driven streamlined balloon without interior structural members.

BLIND-FLYING. To fly without being able to see the ground, using the instruments for maintaining the ship on the proper course.

BLIP. To rapidly open and close the engine throttle, for filling it with clean gas, usually after a steep glide or dive.

BLISTER. A sheet of clear water raised by the hulls or floats of a seaplane or flying boat



This "greaseball" (mechanic) is busily engaged in "manicuring" (adjusting) this aviation engine.

that is separated from the main body of the water.

BLOCK. A number of engine cylinders in a group or contained in one integral casting or forging.

BLOOM. The iridescent film of "rainbow" colors on the surface of lubricating oil.

BLUE. The bluish discoloration of an overheated air-cooled engine cylinder. To "blue an engine" is to overheat it.

BOG-DOWN. To sink the landing-gear wheels in deep mud or snow so that the plane cannot take-off.

BOILER. A sneering reference made to an old broken down or obsolete airplane or engine.

BOND. To connect all metal parts of an airplane frame together with good electrical connections so that it can be employed for radio equipment.

BOOM. A long spar or beam. The "tail-booms" connect the tail surfaces with the main wing structure in pusher-type planes.

BOOTLEG FLYING. Flying without a license or permit.

BOOTLEG PILOT. An unlicensed pilot.

BRASS-POUNDER. Radio operator transmitting by code.

BRG. Abbreviation for BEARING.

BRICK GLIDE. An airplane with a poor gliding angle. (2) An abrupt vertical descent or drop.

BRODIE. A steep dive.

BUCKING. An engine that runs irregularly due to ignition defects, etc.

BUGS. Defects in the plane or engine.

BUG-CHASER. An inspector or "trouble-shooter" who locates and remedies defects in the plane or engine.

BUILDING UP TIME. Flying for the purpose of getting the number of hours required for a more advanced license. A certain number of flying hours is required for each grade of pilot license, hence the ambitious beginner "builds-up time" to gain the coveted license in the grade above him.

BURST. A number of shots fired in rapid succession from a machne-gun.

BUILDER. One who builds up time.

BULL-HEAD. A plane in which the control or maneuverability is very poor. A plane that is hard to steer.

BUMPY WEATHER. Weather in which the vertical air-currents induced by the sun cause rough riding similar to that experienced in an automobile when driving over rough roads.

BUOY. A floating but anchored guiding post.

BX. Rubber insulated wire contained within a flexible metal armor or protective sheath.

BYPASS. A path arranged by which a fluid or gas is allowed to run around a certain point in a circuit.

(C)

CABIN-PLANE. A type of airplane in which the passengers and pilot are enclosed and protected from the wind.

CABRE'. A ship flying tail low or with the tail dragging.

CARBONIZED. (1) An engine containing deposits of carbon or soot in the cylinders. (2) Welded joints containing too much carbon, making them brittle and weak.

CARB POPPING. Explosions in the carbureter due to a weak mixture.

CARGO. The paid load on a commercial plane.

CASINGHEAD-GAS. Gasoline manufactured from natural gas.

CAT-LINES. Long ropes or lines used for connecting the bag and basket of a balloon. Any system using more than two supporting ropes or cords.

CATERPILLAR. A member of the "caterpillar club," or a person who has saved his life by jumping from a disabled aircraft with a parachute. An escape from death by jumping automatically makes one a member of the Caterpillar Club.

CATERPILLAR CLUB. An organization with a membership wholly composed of men and women who have saved their lives by jumping from aircraft with a parachute. There are now several hundred members.

CAT-WALK. A narrow runway or walk used for gaining access to the engines.

CEILING. (1) The upper limit. (2) The "ultimate ceiling" is the greatest altitude to which an aircraft can ascend. (2) The "service ceiling" is the greatest altitude to which an aircraft can ascend with a specified amount of climbing ability still remaining. (3) In meterology, the ceiling is the altitude of the under surface of the clouds.

C. G. Abbreviation for CENTER OF GRAVITY.

CHASER. A small high-speed military plane more properly called a "pursuit plane."

CHECK-FLIGHT. A test flight in which a pilot determines the flying ability of a person applying for the rental of a plane, for instruction or other reasons. A "double-check flight" is made in many schools, first by the regular instructor and then by the "checker" pilot in order to determine whether the student is ready for his first SOLO flight.

He Flies for Ethiopia

John C. Robinson, the Chicago pilot who is casting his lot with Ethiopia.

KNOWN as the "Brown Condor of Ethiopia", John C. Robinson, a colored pilot from Chicago, is the leading ace of the African empire.

From late reports, he is doing mighty well in the dog-fighting line in spite of the inferior equipment with which he is supplied. He is, at least, equipped by nature to combat a torrid murky climate that has proved fatal to many of his white companions.

Parachute Trainer Tested

STUDENTS in parachute operation may make their initial jumps now without bailing out of an airplane. A device was recently demonstrated before Navy and Bureau of Air Commerce officials whereby a student is taken to the top of a 115-foot tower and fitted into a normal type of chute harness. Instead of leaping off in free air, however, his parachute is attached to a cable which guides it to the earth, at the same time holding it open.

Amelia Earhart and Eugene Vidal each made jumps and were enthusiastic about the new device. The demonstration took place a few weeks ago at Prospertown, New Jersey.

Device For Opening Parachutes

A NEW device, which, it is claimed, makes it possible for a parachute jumper to bail out and not worry about having to open his parachute, was recently tested at Leningrad, Russia. The device is said to automatically open the chute at any altitude desired, and can be set before leaving the plane, or before even leaving the ground.

Keeping Up With the Sky-Louse

LATE reports on the Sky-Louse, obtained from England, Europe and elsewhere, are not quite so favorable as they were at the beginning of the Big Agitation.

It seems to be the old case of "many were built but few were flown." We have now arrived at the point where the ships, at least many of them, are out of the optimistic construction stage and are being test-hopped. Many have proved to be only dream-ships while others have fluttered feebly in the ozone and have then become resigned to their fate and flopped over on their backs.

Our last consignment of Sky-Louse news from the other side shows an interesting photo of a test-hopped Sky-Louse awaiting the count of ten. Very fortunately, the pilot was not seriously injured and apparently the Louse is ditto so that it may live to fly another day.

Air-Conditioning on Pennsy

MISS Caroline Cone, daughter of the Assistant Director of Aeronautics, christened the new air-cooled transport of Pennsylvania Airlines. This plane is the first to be cooled by the new flash method of air-cooling developed by the Frozen Carbonic Corporation.

During the summer months, transport ships that remain on the ground for any length of time, reach cabin temperatures that are uncomfortably warm. Older and slower methods of cooling cannot be employed, due to the necessity for dispatching these planes within a few minutes of their arrival.

As soon as the planes are cleared of passengers, a ground attendant enters with the apparatus developed by the Pittsburgh concern and sprays the interior with "dry ice" which has a temperature of 110 degrees below zero.

Miss Caroline Cone, christening the air-conditioned transport of the Pennsylvania airlines. Beside her is a steel flask of liquid carbon dioxide used for cooling the plane.

The Perils of Carbon Monoxide

by LAWRENCE A. CLOUSING

Instructor of Aeronautical Engineering, Northwestern University. Lieutenant (j.g.) U. S. N. R.

There is no doubt but what carbon monoxide gas has been the unsuspected cause of many airplane accidents. When this insidious gas leaks into the cockpit or other occupied space in the plane, it may be the cause of overwhelming sickness or even death.

AS a pilot, sometimes in flight I have had slight headaches, even periods of nausea. I have usually laid these troubles to just common everyday air sickness. But recently there has been prepared a report by the Army which illuminatingly lays these very ailments right at the feet of that foe of the airman, carbon monoxide gas.

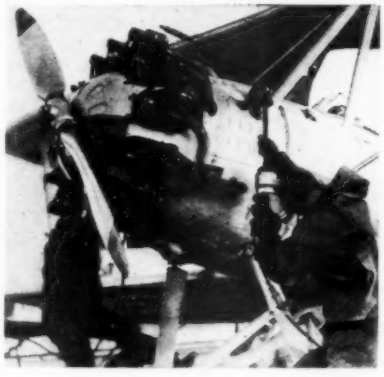
So insidious are the effects of carbon monoxide gas on a person, that the average pilot is unaware of its presence. Though it is more often only a source of headache and sickness to a pilot, it may even be the cause of disaster. Mute evidence of this is offered by the crash of the racing airplane of Major Page in the 1930 Thompson air races. It was found from samples of his blood that Major Page had been overcome by carbon monoxide.

If you could smell CO in its pure state, it would slightly resemble garlic. But when diluted, as it is in the cockpit of an airplane, even this odor is inadequate to denote its presence.

A strange feature of carbon monoxide gas is its chemical reaction on the body of man and beast. For instance, because carbon monoxide is a poison to man is no reason why it is a poison to mice. A mouse can tolerate a very high percentage of CO in the atmosphere, whereas a man breathing for one hour an atmosphere of 6 parts CO to 10,000 parts air, or .06 percent., suffers a slight bad feeling; and in breathing .09 percent. carbon monoxide usually has headache and nausea as might be felt in common air sickness. In an atmosphere of .15 percent. CO a man is in danger of coma or death. Even in the worst combination here mentioned, a mouse would scamper and play even as our dear friend Mickey Mouse.

Official photo, U. S. Navy.

An engine installation with short stacks from each cylinder, an arrangement which, in general, causes an excess of carbon monoxide to enter the cockpit. The top cylinder in this particular plane, however, has a special stack on the top cylinder which deflects the gas away from the cockpit. The ship is a Vought O3U-3 seaplane.



Official photo, U. S. Navy.

This radial engine is partially fitted with a collector ring. It is not a good arrangement for the twisting motion of the propeller slipstream will blow gases from the upper collector ring into the cockpits.

Now to get down to technical details, the process is this. Haemoglobin in our blood carries oxygen around to all our tissues. It does this by uniting with the oxygen in the air we breathe. The only bad thing about carbon monoxide is that it is too attractive a lover. The moment it enters the lungs dainty Miss Haemoglobin deserts her steady, and faithful friend oxygen and readily succumbs to the ardent pleas of the new lover, carbon monoxide.

Mathematically, her love is 300 times as great for carbon monoxide as it is for oxygen. So you see, friend oxygen hasn't even a chance. The only way oxygen can keep his love, Miss Haemoglobin faithful, is simply by keeping the villain carbon monoxide out of the picture. The haemoglobin in friend mouse is more faithful to oxygen.

You see, carbon monoxide poisons human beings only because it prevents the oxygen in the blood from being delivered to the tissues of the body. In other words human beings merely suffocate in effect. When a sufficient amount of the haemoglobin of the body unites chemically with carbon monoxide, usually about 70 to 80 percent., a person dies, simply because he or she doesn't get the oxygen delivered to the proper part of the system. If a person has inhaled some carbon monoxide, and then gets out of the poisonous atmosphere, the haemoglobin, which has become attached to carbon monoxide, gradually reunites with oxygen and he is none the worse for the experience. The bodily

Official photo, U. S. Navy.

The radial engine of this F4B-4 is fitted with a collector ring so that the exhaust takes place midway of the fuselage, but is placed so that it is on that side passed by the propeller on its up-stroke. For the least monoxide gas, the exhaust should be placed on that side passed by the propeller on its down-stroke.

functions of the individual then return to normal.

The effect which carbon monoxide may have on an individual also depends on the length of time he has been breathing it. Long exposure to slight amounts will most likely produce more serious effects than will a short exposure to a high concentration.

This is for the reason that the body has been under partial suffocation for a longer time. For instance, a concentration of carbon monoxide of .05 percent. will throw 40 percent. of the haemoglobin out of useful service if breathed for 4 or 5 hours. This is especially fearful, when it is realized that 80 percent. of haemoglobin out of commission produces death and is all the more fearful when it is realized that some of our military planes of the past have had carbon monoxide percentages as high as .026 percent.

A rough estimate of the effect of carbon monoxide gas may be had by considering an automobile in a single-car garage with the door closed. Here, a 20-horsepower engine would render the atmosphere deadly in five minutes.

In aviation, the effects are generally not fatal, but it is believed that in setting a maximum percentage allowable in the cockpit of an airplane a very low figure must be given. It is reasoned that anything that interferes with a pilot's well-being, even to the slightest degree, while it may not directly cause physical danger, will cause the lowering of his efficiency.

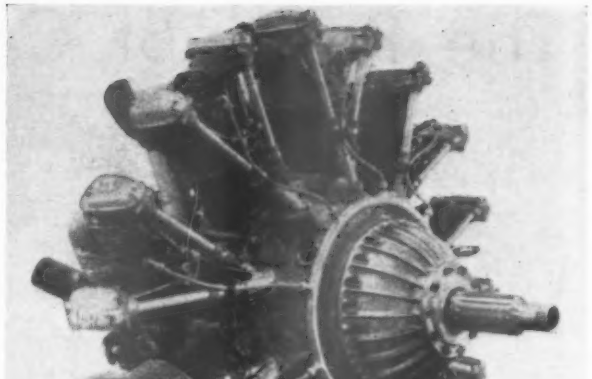
For, after an exposure of several hours, even the mildest portions of carbon monoxide cause a slight band-like constriction around the head, and slight headache. This is followed, when stronger concentrations of carbon monoxide are breathed by nausea and even vomiting. As saturation of the blood haemoglobin with carbon monoxide continues, palpitation of the heart, weakness, dizziness, diminished vision, loss of muscular power, convulsions, coma, and death occur in the order given.

Worse than this, if carbon monoxide poisoning continues over a long period, permanent diminished sight or blindness may occur.

Then, too, in high altitude flight the effects of carbon monoxide are greater, because the blood is more readily attracted to the carbon monoxide.

So it is required in military airplanes that the carbon monoxide percentage in the cockpit be kept down to below .005 percent. It would, of course, be better to state that no carbon monoxide should be allowed, but the measuring instruments are not quite accurate enough. They will show sometimes a percentage of .002 percent. carbon monoxide in an atmosphere known to be absolutely free from carbon monoxide. So the best is made of the situation.

Studies have shown why some planes have more carbon monoxide in the cockpit than others, and in all modern military airplanes the results of these studies have been reflected in the design of the collector rings and fire wall of the engine installation. In airplanes of several years ago air-cooled engines with short exhaust stacks were quite common. In such a type of airplane it was found that a percentage of .026 CO was present, and as a general average that in that type of engine installation a percentage of .0123 CO occurred. These are above the safe limits.



The exhaust stacks in this English radial engine are short curved elbows that can be used "as is" or connected to a common exhaust manifold.

In "V" or "in line" engines with exhaust stacks midway on the fuselage, approximately only one-seventh as much CO entered the cockpit as above.

When a radial engine was fitted with a collector ring, so that the exhaust took place midway of the fuselage on the side which is passed by the propeller on its down stroke, the CO content in the cockpit was materially decreased.

It was found, also, that even in spite of what appeared to be fairly tight bushings around control rods and such in the fire-wall that CO got into the cockpit via that route. Some fighting airplanes with tunnels for the fixed machine guns allowed CO to enter the cockpit by that route. Then the crankcase breathers, where enters and leaves the engine crankcase, also give out a portion of CO due to the heat to which the lubricating oil is subjected.

It was found that in airplanes where blind flying hoods were used the CO in the cockpit was very largely due to the leaks mentioned in the above paragraph.

There are also other gases in the exhaust from the airplane engine which could have deleterious effects on a pilot. The degree to which they could affect a pilot have also been investigated.

For instance there is carbon dioxide. This gas does not unite with the haemoglobin in the blood and its only effect therefore is to dilute the percentage of oxygen in air. If a person breathes an atmosphere of less than 5.00 percent., he has no symptoms of trouble. In an atmosphere of 7.00 percent. he has slight sweating, if he breathes it for ten minutes; similarly 9 to 10 percent. causes dizziness, headache and sweating at the end of ten minutes.

However, when it is realized that the exhaust of an engine contains but 8 to 12 percent. CO_2 and that but very little of this ever reaches the cockpit of the airplane, it is seen that the deleterious effects are negligible.

The carbon monoxide presence in the exhaust gas is from 1 to 7 percent., so in eliminating the danger from CO the danger from CO_2 is also eliminated.

No harmful effects to pilots of ethyl fluid in the gasoline have been found. The ethyl fluid changes to a lead sulphate, or oxide, or metallic lead during the combustion process in the engine cylinder, and then these substances are thrown out as particles in the exhaust gases. Their quantities are quite minute.

Tests were made in which animals were made to breathe this particle laden exhaust smoke, and then the lungs of the animals were removed. Tests showed that but 15 percent. of the lead particles inhaled remained in the lungs. Even with this there was no evidence of lead poisoning in the animals although they were exposed for eight months in an atmosphere containing a higher concentration of lead particles than was allowable from the standpoint of carbon monoxide.

From the foregoing let us summarize. Carbon monoxide poisoning is insidious. Unless a pilot is familiar with its early symptoms and takes immediate steps to land the offending airplane, the results may be serious. Tests of all airplanes for carbon monoxide content should be made at factories, a .005 percent. concentration being the limit.

In case a person is overcome by carbon monoxide, remove him to fresh air. If available give pure oxygen or a mixture of oxygen with 5 percent. CO_2. If oxygen is not available, give artificial respiration as to a person drowned. Keep the person warm by rubbing and by blankets.

The primary lesson is, avoid CO.

Activities of Our Aero Clubs

We gladly accept and publish news from members of flying clubs of all kinds, regarding the organization and operation of the clubs. Send us the story of your club. It may help others in forming their clubs.

WHAT we believe to be one of the most prosperous and successful flying clubs in the United States, is the Aero Sportsmans Club, Inc., Akron, Ohio. It has accomplished things and is constantly advancing interest in private flying, in and about Akron.

We had a very pleasant visit from the organizer and president of the club, Mr. Ray H. Grenzow, who gave us much useful and interesting data on this group of Akron enthusiasts. The club has been in operation for about two years and has a membership of nineteen persons, all of whom have soloed. Up to the time of Mr. Grenzow's visit, the club had run up a total of more than 400 air-hours.

A Hammond training plane, powered with a Kinner K-5 engine, is the property of the club and further, the club is said to be perfectly solvent—which is certainly some news in these times. This is undoubtedly due to the fact that the officers are business men and have handled the affairs of the club on a businesslike basis which is not always the case with aviation clubs.

They have cut the cost of solo flying time down to $4.80 per hour which is a very reasonable figure considering the size of ship used. This is a three-place plane and not a small lightplane, a fact that must be taken into consideration when the costs are figured out.

The membership dues and the financing are interesting. The price of a membership is $85.00, with $34.00 paid in cash on enrollment and $4.25 per month for one year. Dual instruction is charged for at the rate of $7.00 per hour and, as we said previously, solo time is $4.80 per hour. This arrangement brings the cost of operation down to the point where it is practicable for the average man and yet is sufficient to guarantee freedom from club debts and other annoying features of the usual aviation club.

The officers are: Ray H. Grenzow, President; A. Kent Clark, Vice-president; A. D. Miller, Secretary and Treasurer. We most certainly congratulate these gentlemen upon their achievement and wish them and their fellow members many happy hours in the air.

The Hammond 3-place training plane owned by the Aero Sportsmans Club, Inc., of Akron, Ohio. Seven members of the Aero Sportsmans Club, Akron, Ohio, standing by their Hammond Training plane.

* * *

MALCOM BELL, 106 Groton Ave., Cortland, N. Y., sends us an interesting note concerning a model airplane club that he and his friends are endeavoring to organize.

In the first place, and most unusual, this is to be a correspondence club by which the members can exchange ideas on model building. They plan to give awards for club records, the cost of which is to be defrayed by the contribution of ten cents by each member to cover expenses.

We would suggest, however, that it be fully understood by all concerned that every member must enclose a stamped and addressed envelope for each reply, for continued correspondence eats up the funds very rapidly, and would soon eat up the money set aside for the awards.

* * *

AND now, we announce the Towanda Flying Club, 506 Main St., Towanda, Pa., of which Miss Genevieve Crayton is secretary and treasurer.

She tells us that the club has just purchased a plane and that it has twenty members. From her letter, however, I should judge that there will be plenty of excitement ahead for them since she requests information on license regulations and inspections.

If the club will accept our poor suggestions, we advise that a licensed instructor pilot be consulted at the first opportunity so that the club will not have a run-in with the local authorities. This matter is much too complex to suggest in these columns and the information could be obtained much more satisfactorily from a local pilot.

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A LONG letter from the "Flying Clubs of America," Newark (N. J.) Division, describes their objectives and achievements. We gave a brief talk about this club in an earlier issue of P. A., but we now have all the dope on this organization from William A. Criger, 410 Badger Ave., Newark, N. J.

He first calls our attention to the fact that the actual cost to the members is $2.00 per week, not $3.00 as previously announced. The club now has fifty members, six of whom have already soloed and new members are being registered every week. They have an Aeronca and expect to add another plane within a short time, which speaks well of the ability of the club. The members come from all walks of life and include two doctors, several lawyers, school-teachers, an airline hostess, several business men, high school and college students, factory and office workers.

Our correspondent says that they have been particularly fortunate in obtaining competent instructors. The first instructor is Lieut. Rawlings of the National Guard, a very active and valuable asset to the club in many ways. During the time that Lieut. Rawlings was called away on maneuvers, this summer, they acquired the services of H. B. Jennings, now retired after serving twen-

This is the Aeronca owned by the Newark (N. J.) Division of the Flying Clubs of America.

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ty-one years in the navy, seventeen years of which was in the aviation corps.

The accompanying photograph shows the school's Aeronca, taken at the time of its delivery and is said to be the "flyingest plane" at the airport because it is in the air virtually every hour from dawn 'till dark, six days per week. The photo was taken just before the first flight with the first student, Miss Constance Deverall.

* * *

THREE years ago, The Kanawha Flying Club, Charleston, West Virginia, was founded by twenty-five young business men who appreciated the advantage of having a flying club within a five minute walk from the center of town. That this is a mighty active outfit will be proved by what is to follow.

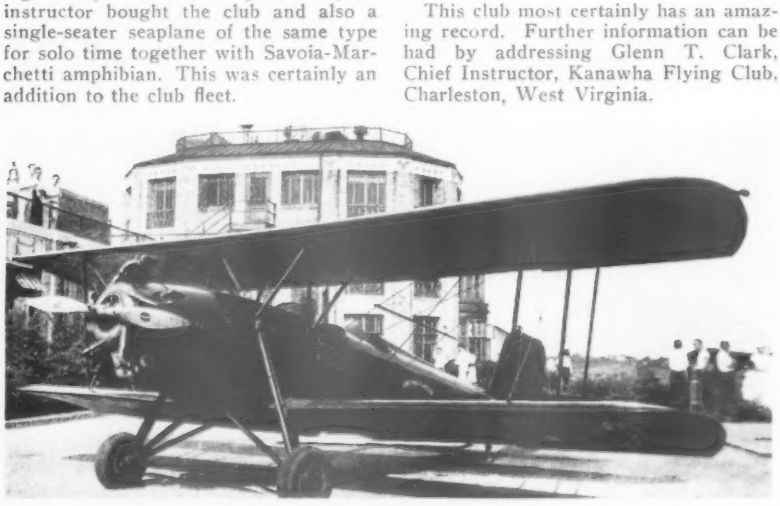
The group secured a local pilot to teach the members on their little Aeronca Collegian seaplane. Within a year or so, the instructor bought the club and also a single-seater seaplane of the same type for solo time together with Savoia-Marchetti amphibian. This was certainly an addition to the club fleet.

And then came the first accident. One of the students put the single-seater into a power-dive and stripped off the wings. He jumped but too late for his parachute to open and was killed. This was the only accident to mar the record of the club and this was not really an accident but simply recklessness on the part of the student.

The other seaplane was sold, early this year, and a new Aeronca was purchased for passenger, cross-country flights, dual instruction and emergency inquest flights. The last coroner of the county was a private pilot who ran up approximately sixty hours on these flights.

Since the opening of the club, eighty-two students have soloed and hundreds of passengers have been carried on sightseeing trips, and instruction flights. Robert Cummings, of Kayford, has the honor of being the eighty-second student to solo.

This club most certainly has an amazing record. Further information can be had by addressing Glenn T. Clark, Chief Instructor, Kanawha Flying Club, Charleston, West Virginia.



This is the Hammond 3-seater owned by the Aero Sportsman's Club, Inc., Akron, Ohio. This is a fine ship for club training and general service.

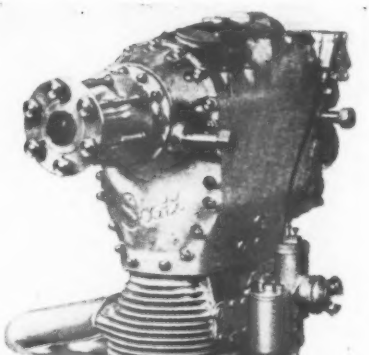
The French Bloch "200" Bomber Appears

FRANCE has just produced a bomber of very unusual design. In some respects it recalls the "Heyford Express" with its elevated fuselage, and again, the windowed cabin beneath the fuselage rather suggests the Zeppelin idea. It would be ideal as a sight-seeing plane.

This plane is known as the Bloch "200". It can be employed as a bomber in military service or as a passenger transport on commercial airlines. It would seem that this arrangement of the cabin (which, by the way was once suggested by a "Dreamship designer) would be productive of much head resistance. More news will follow.

This French Bloch "200" is a distinctive bomber design with peculiar accommodations for the personnel and a unique perch for the pilot.

The Scott "Flying Squirrel" Engine



This is the Scott "Flying Squirrel", an English lightplane engine that develops 34 h.p. and sells for approximately $250. *Courtesy of The Aeroplane.*

EVIDENTLY, the Pou du Ciel has resulted in or hastened the development of several English lightplane engines of which the Scott "Flying Squirrel" is a prominent example. This fine compact little engine is being produced by the Scott Motor Cycle Co., Shipley, Yorks, England.

This is another example of a two-cycle engine of the two-cylinder inverted type. It develops 34 h.p. maximum at 5,200 r.p.m. but the normal rating, however, is 16 h.p. at 2,800 r.p.m. The dry weight is 85 pounds.

It is equipped with a standard Amal carbureter and a two-spark magneto running at engine speed. Being a two-cycle type, the engine gives two power impulses per revolution, or the impulse equivalent of a four-cylinder engine of the four-cycle type.

Because of the very high engine speed, the propeller shaft is geared down with a 2:1 ratio, with straight spur type gears. The driving pinion is mounted on the crankshaft between the two crankpins while the hollow prop shaft is carried in roller bearings at the gear end and by a deep-groove ball-bearing at the prop hub end.

The fuel consumption is given as 0.56 pound per brake-horsepower-hour and the lubricating oil consumption is 0.03 pound. This is good economy for a two-cycle engine, both in regard to gasoline and oil consumption which usually runs around 0.65 pound for the gas.

Two-cycle engines have many advantages as powerplants for lightplanes. They are of simple construction, there are few parts to wear out or to give trouble and the maintenance cost is correspondingly low. However, this type has unfortunately received a bad reputation in this country that it would be difficult to outlive no matter how good the engine might be.

The Sopwith World War Planes

by W. A. HATFIELD

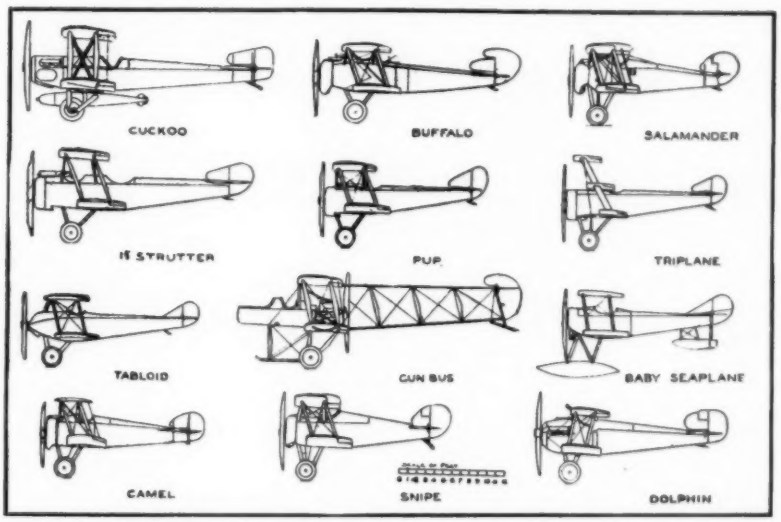
A brief review of the various types of Sopwith planes employed during the world war with tabulated data on their dimensions and performance. Twelve different types of Sopwith planes were produced during the war which gave a good account of themselves.

THE GREATNESS of the House of Sopwith began with the Sopwith "Tabloid" which in 1913 had such a profound effect upon airplane design. This little ship was a two-seater of the side-by-side order equipped with an 80-horsepower Gnome engine. It was originally intended for the private use of Harry Hawker but was later built in considerable quantity for the British Army in a revised form as a single-seater.

The Tabloid, after it joined the army, cleared up a number of disputed points. First of all, its surpassing speed proved that a biplane could be just as fast or faster than the accepted monoplane. After this, the biplane became the standard in armies the world over. This speed was not great—as present speeds are measured—being only 92 m.p.h., but it showed up the monoplanes by the fact that it could fly as slowly as 36 m p.h., the speed range being far better than any plane had previously exhibited.

Our friend, the Tabloid, started out with wing-warping lateral control instead of ailerons. It had a skid type landing-rear and no fixed vertical fin. Later on, they stuck the fin in front of the rudder, tied the can on the skid, installed a vee type gear, and used ailerons in place of wing-warping. When all this was done, it proved to be an excellent scout machine and was used extensively. It should also be noted, among other things, that the Tabloid was one of the earliest single-bay types with only one pair of outer struts, thus simplifying life for the riggers and cutting out a lot of whistling in a dive.

From this promising start with a tractor type, the House of Sopwith turned right around in its tracks and built the "Gun Bus," a pusher type, for the Greek Government. This design did not quite go back as far as the Model "B" Wright nor the Farman "Box-Kite," but it was a notable detour from the Tabloid. It never reached the Grecks, however, for before the pusher was completed, the great big World War started in and the Gun-Bus collection was commandeered by the British Government, thus conferring a great favor to the Huns. A number of pushers were turned out equipped with a variety of engines, 100 h.p. Gnomes, 150 h.p. Sunbeams, etc.



Side elevations of the Sopwith World War planes, showing the distinctive characteristics of the various types. Here are the well known "Pup," "Dolphin," "Camel," etc.

Then followed an era of seaplane construction at the Sopwith plant which included a torpedo seaplane in 1915, the father of the famous "Cuckoo." It was equipped with a 200 h.p. Canton-Unne' engine. After the torpedo plane was completed, the British Admiralty ordered a number of tractor type seaplanes fitted with 100 h.p. Gnome Monosoupapes. These ships were provided with folding wings and a few experimental landplanes were built after the same general design although differing in detail.

The "Baby Seaplane" descended from the Tabloid, the principal difference being that floats were employed instead of wheels, and one of its predecessors, before the War, won the Schneider Trophy race at Monaco. The engine originally used on the Baby was a 100 h.p. Gnome, but 110 h.p. and 130 h.p. Clerget engines were used later. While some preliminary work had been done on the Baby, at the beginning of the war, it was not until November, 1914, that the Baby was put into active service, a service that continued successfully until the signing of the Armistice. This is a most remarkable performance for any one single type of ship at a time when design changed over night.

And now we hear from the "1½ Strutter" which has claim to historical distinction in many respects. It set a new fashion in warplanes that was copied extensively.

Our Sopwith 1½ Strutter, originally designed as a high performance two-place fighter had good performance, good maneuverability, climb and ceiling. It established a world's altitude record of 23,980 feet and was an all around success, so successful in fact, that many were built for Roumania, Russia, United

Type of machine.	Length o.a.	Wing span.		Wing chord.		Wing area.*			Incidence		Gap.	Stagger.	Sweepback.	Dihedral		Ailerons area.	Area.			Area.		
		Top.	Bot.	Top.	Bot.	Top.	Bot.	Total.	Top.	Bot.				Top.	Bot.		Tail-plane.	Ele-vators.	Total.	Fin.	Rudder.	Total.
	ft. in.	ft. in.		ft. in.		square feet.			°	°	ft. in.	ft. in.	°	°	°	sq. ft.	square feet.			square feet.		
Tabloid ..	20 4	25 6	25 6	5 1½	5 1½	128·3	113	241·3	1·0	1·0	4 6	0 11	0	1·5	1·5	28	11·8	11·8	23·6	1·8	4·27	6·07
Gun 'bus..	32 6	50 0	50 0	5 1½	5 1½	246	228	474	4·0	4·0	5 6	1 0	0	3·5	3·5	60	28·0	28·0	56·9	8·75	13·0	21·75
Baby sea-plane ..	28 10	25 8	25 8	3 2	3 2	128	112	240	3·0	3·0	4 6	0 8	0	2·0	2·0	0	14·0	12·0	26	2·7	6·3	9·2
1½ strutter	25 4	33 6	33 6	5 6	5 6	183	170	353	2·45	2·45	5 5	2 0	0	2·45	2·45	52	35·5	21·5	57	3·5	7·25	10·75
Pup ..	19 4	26 6	26 6	5 1½	5 1½	132	122	254	1·5	1·5	4 5	1 6	0	3·0	3·0	22	23·0	11·8	34·8	3·5	4·5	8·0
Triplane†	18 10	26 6	26 6	3 3	3 3	84	75	231	2·0	2·0	3 9	1 6	0	2·5	2·5	34	14·0	9·6	23·6	2·5	4·5	6·5
Camel ..	18 9	28 0	28 0	4 6	4 6	125	115	240	2·0	2·0	‡	1 6	0	0·0	5·0	36	14·0	10·5	24·5	3·0	4·9	7·9
Snipe ..	19 10	31 1	30 0	5 0	5 0	138	133	271	1·8	1·8	4 3	1 4	0	4·0	4·0	45	15·0	11·0	26·0	2·75	9·0	11·75
Dolphin ..	22 3	32 6	32 6	4 6	4 6	132	131·25	263·25	2·0	2·0	4 3	1 0	0	2·5	2·5	38	17·0	13·5	30·5	3·5	8·0	11·5
Cuckoo ..	28 6	46 9	46 9	6 9	6 9	290	276	566	3·0	3·0	6 0	0 0	0	2·3	2·5	80	35·6	18·0	53·6	5·7	8·0	13·7
Buffalo ..	23 3½	34 6	34 6	5 6	5 6	162	164	326	1·8	1·8	4 6	1 9	0	2·5	2·5	44	23·0	15·8	38·8	4·0	9·0	13·0
Salamander	29 6	31 2½	30 1½	5 0	5 0	139	133	272	1·8	1·8	4 3	1 5	0	4·0	4·0	51	15·0	11·0	26·0	2·75	9·0	11·75

* Including *ailerons.* † Middle plane: Span 26 ft. 6 ins., chord 3 ft. 3 ins., area 72 sq. ft. ‡ 5 ft. at root, 4 ft. at tip.

States and Belgium in addition to those in the British service.

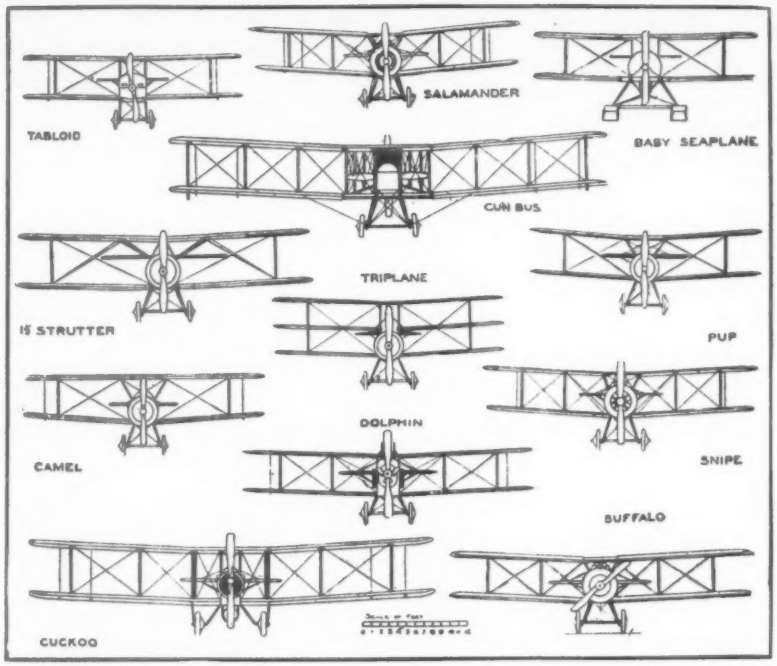
The design of the cabane struts, which was a novelty, gave this ship its nickname. The top plane was in two halves, bolted to the top of a central cabane while the spars were provided with an additional pair of shorter struts running from the top longerons of the fuselage to the top plane spars at some distance from the body. In the single-seater models, this same type of bracing was employed except that the central portion of the cabane was eliminated, the "W" shape outer struts supporting a separate center section.

We will all take particular interest in the fact that the "1½ Strutter" was equipped with air-brakes in the form of adjustable flaps in the trailing edge of the wing for assistance in landing and also trimming gear by which the incidence of the stabilizer surface could be adjusted to meet varying conditions of load and rate of climb. This practice has recently become universal on transport planes and it is very interesting to know when this practice originated and where. Air-race fans please note.

Originally designed as a two-seat fighter, the Sopwith "1½ Strutter" was later developed into a single-seat bomber which very successfully laid eggs on Essen, Munich and Frankfort. When equipped as a bomber, it was fitted with a 130 h.p. Clerget engine instead of the 110 Clerget originally fitted in the two-seater.

But, now we get to the point where we first hear of the Sopwith menagerie, the Pup, Camel, Salamander, Snipe, Dolphin, etc., which are featured in all regulated war stories. The first of this series was the "Pup" which carried features of both the Tabloid and the 1½ Strutter.

The Pup was brought into being with the object of taming the Fokker monoplanes that were doing so well on the Western Front that they threatened to wipe out the Allied air forces. The little Pup politely handed back the inferiority complex to the enemy air-service which was then compelled to speed up further development work to keep the Pups from sinking the last of the Hun monoplanes.



Front elevations of the Sopwith planes drawn to scale as published by the R. F. C. shortly after the end of the war. A great variety of types is listed under the Sopwith specifications.

In spite of the fact that the Pup was only provided with a 80 h.p. LeRhone engine, it put up an excellent performance and was held in the highest esteem by the pilots who enthusiastically praised its ease of handling and maneuverability. A single fixed gun fired through the propeller while the pilot, who sat beneath the wing, looked through window panels in the top wing.

There was also a sea-going edition of the Pup, specially devised for making deck landings with the North Sea Patrol. This entailed only slight modifications so that we will pass it up for the next sensational Sopwith production which is—the Sopwith Triplane.

Of the few triplanes in the World War, there was none so capable as the Sopwith "Tripe" or "Tripehound" equipped with the 130 h.p. Clerget engine. The primary purpose in bringing

(*Continued on page* 400)

Type of machine.	Engine.		Weight of machine.		Fuel capacity.	Range (in miles).*	Speed (m.p.h.)			Climb (in mins.) to			Ceiling.	Landing speed.	Load/sq. ft.	Load/h.p.	Military load.
	Type.	H.P.	(empty) lbs.	(loaded) lbs.	lbs.		6,500	10,000	15,000	6,500	10,000	15,000	ft.	m.p.h.	lbs.	lbs.	lbs.
Tabloid	G.	80	730	1,120	245	320	92†							36	4.66	14.0	
Gun 'bus	S.	150												40			
Baby Seaplane ..	C.	100												45			
1½ Strutter ..	Le Rh.	110	1,281	2,205	404			103		10.5	18.9	41.5	16,000	35	6.4	17.5	160
1½ Strutter ..	C.	130	1,316	2,342	502		102	98.5		12.7	24 6		13,000	35	6.7	18.8	344
Pup	Le Rh.	80	787	1,225	178	320	106.5	104.5	94	8.0	14.4	30.1	17,500	30	4.8	14.6	80*
Pup	G.M.	100	856	1,297	181	190	107	104	100	7.1	12.4	23.4	18,500	30	5.2	12.4	80
Triplane	C.	130	1,103	1,543	180	310	112.5	106.5	95	6.5	11.8	22.3	20,500	35	6.0	12.4	80
Camel	Le Rh.	110	889	1,422	252	330		118.5	111	5.2	9.2	16.8	24,000	35	6.2	10.4	101
Camel	G.M.	150	993	1,523		275		117.5	107		10.2	19.6	23,700	35	6.5	10.13	
Camel	C.	130	929	1,453	243	300		113	106.5	6.0	10.6	20.7	19,000	35	6.3	11.5	101
Camel	G.	100	882	1,387	224	300		106	100		11.8	23.2		35	6.0	13.8	101
Camel	A.R.1	150	977	1,508	250	290	116.5	111	103	5.5	9.8	20.0	18,000	35	6.5	10.0	101
Camel	B.R.1	150		1,470		310		121	114.5		8.3	15.8	23,000	35			
Camel	B.R.1	150	1,036	1,530	223			118	112		11.5	25 0	18,000	38	6.7	10.2	91
Snipe	B.R.2	230	1,310	2,020	343	370		121	113		9.5	18.8	20,500	40	7.5	8.86	365
Dolphin	H.S.	200	1,406	1,881	194	230	131.5	128.5	124	4.9	8.25	14.7	23,500	40	7.3	9.0	101
Dolphin	H.S.	300	1,566	2,358	504	290		140	133‡	5.2	8.3	12.2‡	24,600	40	9.0	7.5	107
Cuckoo	H.S.	200	1,840	3,370		420		100		14.5	26.0		19,000	40	6.4	17.0	
Buffalo	B.R.2	230	2,230	3,100	380	275	100§			4.9‖	9.5¶			60	9.5	13.5	
Salamander ..	B.R.2	230	1,844	2,510	258		123	117			17.1		14,000	60	9.4	11.0	410

G = Gnome. G.M. = Gnome *monosoupape.* S = Sunbeam. Le Rh. = Le Rhone. C = Clerget.
H.S. = Hispano Suiza. * At full speed. † At ground level. ‡ At 16,400 ft.
§ At 5,000 ft. ‖ To 3,000 ft. ¶ To 5,000 ft.

High-Lights and Side-Lights

by M. A. RODDY

Pertinent notes upon the progress of aviation and brief notes on the aviation personnel. Read the snappy paragraphs dealing with the doings of the month.

WILLIE WHISPERS, our Washington under-cover man, writes to say that there is very little sailing on the Potomac and, after wearing out three sets of false whiskers and of course a couple of pairs of soft shoes, Willie learned that Congress was in recess which naturally explained the lack of wind so necessary for sailing.

However, a big blow is expected during the next session of Congress when Senator Pat McCarran presents his bill for permanent legislation regarding the air industry. In the meantime Willie is keeping his glass eye on the situation and will report all developments . . . if any.

* * *

FELIX WAITKUS of Chicago was forced to land in Ballinrobe County Mayo, Ireland, after a 3,000 mile solo flight from New York on a flight which was to terminate in Kaunas, Lithuania, to commemorate the trip of Stephen Darius and Stanley Girenas who crashed to their deaths two years ago about 300 miles short of Kaunas.

* * *

BENNY HOWARD, United Air Lines' pilot, won the Bendix Trophy Race which opened the fifteenth annual national air races by 23 and one-half seconds, just nosing out Col. Roscoe Turner for the prize money of $4,500 given the winner of the 2,046 mile race.

It was a double victory for Benny as he also designed and built "Mr. Mulligan" a white, high-winged monoplane which was later flown to victory in the Thompson Trophy Race by Harold Neumann of Moline, Ill., who also won the Greve Race.

* * *

HERE'S ONE FOR THE BOOK: Col. Roscoe Turner made a recent trip across the country traveling by automobile in order to win a wager that he "could not stand" a trip across the country by car.

* * *

SIR CHARLES KINGSFORD-SMITH, world-famous, long distance flyer, may be able to fly his ship, the Lady Southern Cross, blind but when it comes to finding a Chicago hotel in a taxicab Sir Charles is one lost pilot.

On his last trip to Chicago the noted airman left the Municipal Airport planning to stay overnight with his friend, Norman Fellman, manager of the Southmoor Hotel, and was not reported for sometime until in final desperation he was about to telegraph another friend for directions when an obliging clerk looked up a hotel directory and started Sir Charles on his proper course.

All of which reminds me of the time Jimmy Mattern, twice conqueror of the Atlantic, and myself were parting one early dawning on Chicago's north side and Jimmy, who had found his way by plane around the world wanted to know where the Drake Hotel was.

* * *

C. R. SMITH, President of American Airlines, states that the transport line established a new record for the first seven months of this year when 96,428 passengers were carried, representing a gain of 83.13 per cent over the total of 52,653 passengers flown during the corresponding period of 1934.

United Air Lines claims a world's performance record with the completion of

Brig. Gen. Oscar Westover, the acting chief of the U. S. Army Air Corps since the retirement of Foulois.

all but 1,317 of 3,020,241 miles scheduled during the last two months, completing also 99.9 per cent of the 1,400,000 miles of night schedules on its coast-to-coast and other night trips. . . . T. W. A. has passed the 25,000,000 mark in miles flown by aircraft.

With the constant establishment of new records by the leading transport companies, plans are going rapidly ahead for the introduction of new superequipment with double or triple the present seating capacity.

* * *

HARLLEE BRANCH, Second Assistant Postmaster General, has vetoed Mayor LaGuardia's project for removing the air mail terminus for New York from the Newark Airport to Floyd Bennett Field in Brooklyn declaring that the proposed change would cost the Post Office Department an additional annual expense of $125,000, whereupon Grover A. Whalen, chairman of Mayor LaGuardia's committee, was designated to contact Postmaster General Farley in the hope of getting a reconsideration of New York's application for a change of airports.

In the meantime, President Roosevelt has approved an allocation of $3,363,758 for possible use in the development of the Newark, New Jersey Airport.

* * *

BALLOONS: The 27th annual Gordon Bennett International Balloon Race was won by the Polish bag, "Polonia," which was piloted by Captain Zbigniew Burzynski from Warsaw to Stalingrad province, 1,054 miles distant. The United States' pilot Lieut. Raymond F. Tyler with navigator, Lieut. Orville, piloted the American balloon, "U. S. Navy," about 520 miles.

Approximate distances reported for the various entries were: The Polish Polonia, 1,054 miles; The Polish Warsaw, 963 miles; The Polish Kosciuszko, 870 miles; The American U. S. Navy, 520 miles; The Belgian Bruxelles, 497 miles; The Belgian Belgica, 497 miles; the French Lorraine, 448 miles; The Swiss Zurich, 361 miles; The German Deutschland, 348 miles.

* * *

REPAIRS will be completed shortly to the 115,845 square feet of the stratosphere balloon, which collapsed July 12, at Rapid City a short time before the takeoff was scheduled, and a second attempt to explore the upper regions will be made by the National Geographic Society. Already Captain Anderson, Pilot Albert Stevens, Scientific Observer and Meteorologist Williams have returned to the Black Hills to make preliminary plans.

* * *

HENRY MIGNET, French inventor, says that he can build an airplane at a cost of $350 and if there happens to be an old motorcycle handy he can do the job for $100. Oh, Mr. Vidal!

* * *

ACCORDING to the Air Sports League of Berlin the first "air bicycle" was successfully demonstrated when Pilot Duennbell flew about 650 feet at an altitude of one yard flying by means of a propeller operated by foot pedals.

* * *

HANGAR FLYING: Described as the world's largest nonrigid airship "T C-14" successfully concluded recent tests at Scott Field, Ill. . . . For the first time in seven years the United States is officially first in the air in the matter of air records rising from a score of 20 to 45 marks. . . . According to William R. Enyart, secretary of the contest board of the National Aeronautic Association, there are 60 more records which the

United States could capture easily as a result of present technical developments.

* * *

A TABLET has been unveiled at Floyd Bennett Field marking the spot where the late Wiley Post started and landed on his record-breaking solo flight around the world in seven days. . . . Mme. Marie Marvingt, the first French woman to fly, is in the United States as a member of the French Legion and will attend the American Legion convention. . . . Besides flying service during the World War, Mme. Marvingt served in the trenches.

* * *

GOV. JAMES ALLRED has appointed Elliott Roosevelt as a member of an UNOFFICIAL airport development advisory committee that will seek works progress administration FUNDS for improvement of Texas airports. . . . Miss Louise Thaden of Little Rock, Ark., Miss Nancy Harkness of Boston, Mass., and Miss Helen McCloskey of Pittsburgh, Pa., transport pilots, have been appointed "air marking pilots" by the Bureau of Air Commerce to assist in cities in arranging for the markings of roof tops as an aid to airmen. . . . Senorita Maria Elena Rivero says that she "had an understanding" about her marriage with Juan Ignacio Pombo, the youngest pilot to fly the South Atlantic en route to claim the hand of his "inspiration." . . . Joe Crosson, veteran Alaskan pilot who brought back the bodies of Will Rogers and Wiley Post, has been recommended for the Distinguished Flying Cross.

* * *

CLARENCE CHAMBERLIN, while flying near the summer home of Col. Lindbergh, lost the use of one of his motors and managed to make a safe landing with one engine at the local airport. . . . Lincoln Ellsworth escaped injuries when the airplane "Polar Star" cracked up while making a landing at Montevideo, Uruguay, as a result of engine trouble. . . . Pilots J. B. Boyd and Emerson Austen of American Airlines flew from Chicago to Detroit, a distance of 269 miles, in 75 minutes. . . . Clyde Pangborn intends to make a transcontinental test flight preparatory to his world trip. . . . Incidentally the Boeing 247-D flown by Roscoe Turner and Clyde Pangborn to 3rd place in the London-Melbourne air derby last fall is back in routine service on the New York-Chicago division of United Air Lines.

* * *

JOSEPH COSTA of Corning, New York, expects to fly from St. Johns, Newfoundland, to his native Portugal with his father, John, as a passenger. . . . Charles M. Minor, of San Francisco, has completed a one-ton model of an airplane said to be capable of a speed of 600 miles an hour. . . . Senator William Gibbs McAdoo, President of the National Aeronautic Association and his 26-year-old bride, the former Miss Doris Cross, have completed their aerial honeymoon. . . . Captain Earl H. Robinson, of Los Angeles, President of the Motion Picture Pilots' Association and Miss Ruth Merriam, a niece of William Farnum, are married.

Strange As It May Seem—By JOHN HIX

DURALUMIN - THE CHIEF MATERIAL USED IN THE CONSTRUCTION OF UNITED AIR LINES' BOEING PLANES - IS AS STRONG AS STEEL... BUT AS LIGHT AS ALUMINUM....
DRY ICE - THE COLDEST KIND OF COMMERCIAL ICE - IS PUMPED OUT OF THE DESERT NEAR SALTON SEA... ONE OF THE HOTTEST PLACES IN THE COUNTRY ....
THE SHADOW OF AN AIRPLANE IS ALWAYS THE SAME SIZE... REGARDLESS OF THE ALTITUDE...

Answers to the above statements will be found on page 396 of this issue. We wish to thank Mr. Robert Johnson of United Air Lines for these explanatory paragraphs.

A Boeing "247-D" Flying Club Car

SOMETHING new in the way of "flying club cars" was introduced last month with delivery of a high-speed twin-engined Boeing 247-D to the Phillips Petroleum Company of Bartlesville, Okla.

Known as "Woolaroc III," the plane is declared to be one of the most luxurious transports ever produced for executive use, with such features as a berth, walnut cabinets, overstuffed easy chairs, built-in radio for reception of entertainment programs, refrigerator and cabin flight instruments.

In addition to the customary two-way radio telephone equipment, there is an inter-phone radio telephone set in the cabin to permit communication between flying executives and the ground.

Structurally, the plane is the same as the Boeings flown by United Air Lines and other operators in this country and abroad. Equipped with two 550 horsepower geared Wasp engines, its top speed is 202 miles an hour, cruising speed, 189 miles an hour. Special gasoline tanks make possible a non-stop cruising range of approximately 1,000 miles.

Notes on the Rearwin Lightplanes

by EMORY F. SCOTT

An interesting account of a prominent American lightplane now in full production on a commercial basis. This article is in reply to the requests from many readers who have heard of the success of the Rearwin at the Detroit Air Show.

FOR a lightplane to make steady progress, from the very beginning of the depression to the present day, is undoubtedly an achievement worthy of consideration, recalling the setback that aviation has suffered during these adverse times.

During the boom days that followed the war, numerous airplane manufacturing firms mushroomed into existence all over the United States. Most of these organized in the three or four years that preceded the market crash, so that by 1929, several score firms were turning out aircraft of every size and description. A large part of these were shoestring affairs, started by some engineer with an idea and the faculty of cornering some of the loose money that was so much in evidence at that time.

We are all aware of the resulting damage that aviation, which was just getting a foothold, suffered from the crash. To the larger firms, of course, this only meant a curtailed program and more conservative steps in the future, for they were backed by automobile millions, or some other great reserves. But to most of the numerous other adventurers this could mean but one thing—the end.

However, of the few survivors, the Rearwin company is going into its eighth year. This company is producing an airplane that is not merely constructed, but is really designed throughout. Just as the modern automobile has been constructed for ease of operation, as well as beauty, so has the Rearwin followed these principles.

The fuselage and tail-group are of welded steel tubing while the wing is of wood construction. V-type wing struts join at the bottom of the fuselage, well ahead of the cabin door, making for an easy entrance or exit.

The Rearwin "Speedster", powered with an inverted Cirrus 95 h.p. engine that gives it a top speed of 144 miles per hour. This plane can also be supplied with a 125 h.p. Menasco engine.

The cabin has as much or more visibility than the modern airliner, having sliding glass windows on either side, as well as unobscured forward and overhead visibility. The gasoline tanks, instead of being in front of the pilot, are placed overhead at each side in the wing, thus removing one common objection of the small plane.

It has a tandem seating arrangement with dual controls and may be flown from either seat. The wires and tubing, that formerly extended across the cabin, a very objectionable feature, have all been placed at the sides, leaving the cabin large and roomy, even for a tall person, without lessening the strength of the fuselage.

In the space that is usually occupied by the gas tank, the pilot now has additional leg-room. The instrument board is now well ahead, while a novel shelf is placed before it for the pilot's navigation chart.

Besides this extra room, there is a luggage compartment at the rear of the cabin and also sufficient space behind the rear seat for a suitcase.

The Rearwin Sportster is equipped with either a 70 H.P. or an 85 H.P. LeBlond motor.

SPECIFICATIONS.

Rearwin Sportster, Model 7000.
A. T. C. No. 574
Powered with 70 H.P. LeBlond Engine
(As Illustrated).

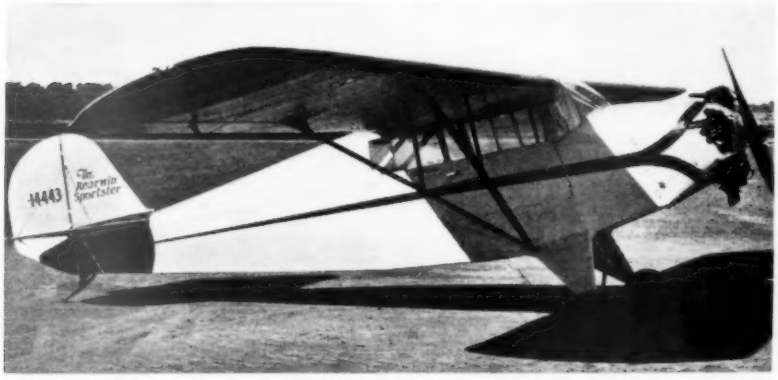
Wing Span	35 ft.
Length Overall	22.3 ft.
Height Overall	6.75 ft.
Wing Area (Effective)	166 sq. ft.
Power Loading	18 lbs. per h.p.
Wing Loading	8.13 lbs. per sq. ft.
Empty Weight	830 lbs.
Useful Load	520 lbs.
Pay Load	190 lbs.
Gross Weight	1350 lbs.
Fuel Capacity	24 gallons
Oil Capacity	2 gallons
Maximum Speed	110 miles per hr.
Cruising Speed	95 miles per hr.
Landing Speed	39 miles per hr.
Rate of Climb	625 ft. per minute
Length of Take Off Run	280 ft.
Take Off	10 seconds
Cruising Range	5 hours
Wheels	7.00x4

Although two years were spent in developing the Rearwin Speedster, it has only been in production for a few months. One of the main attractions at the recent Detroit Aviation Show, the Speedster looks to be the speedy, easily controlled plane that it really is.

Similar to the Sportster, it is equipped with a tail-wheel, larger gas-tanks, brakes and navigation lights. In addition, the Speedster has a new type of "knee-action" landing-gear, with larger tires, wheel-pants, and streamlined fairings to the fuselage.

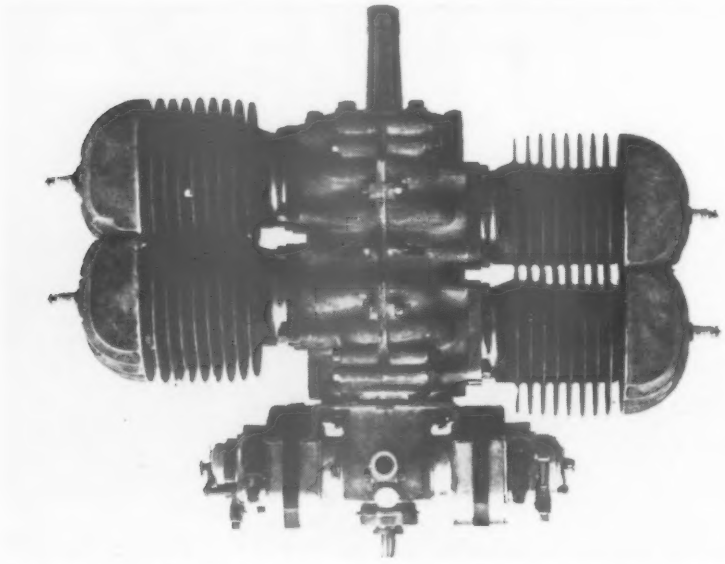
With its inverted engine, this plane

(*Concluded on page* 394)



A side view of the Rearwin "Sportster", a small cabin job powered with a 70 h.p. LeBlond engine. This model has been in production for only a few months and proved to be a sensation at the Detroit Show.

Two-Cycle French Lightplane Engine



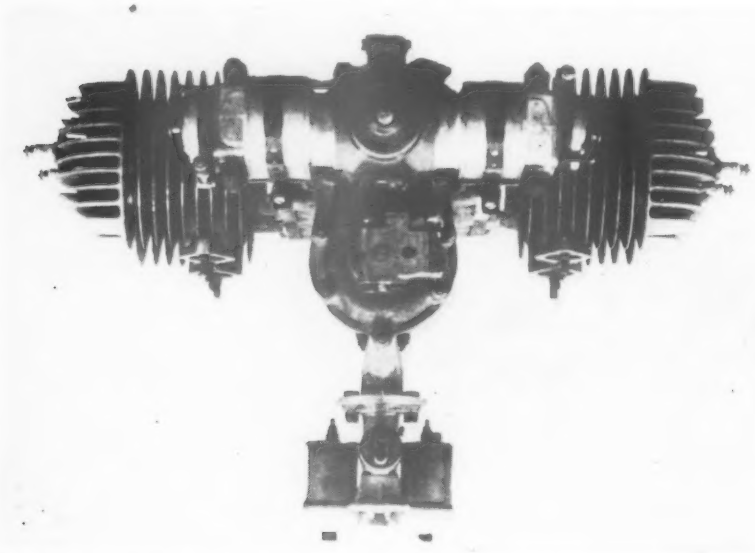
Plan view of the AVA-H4 lightplane engine with the distributor shown at the end of the crankcase.

RAPID development of the lightplane in France has led to the production of many interesting French lightplane engines, one example of which is shown here.

This engine, shown by the accompanying photographs, is the AVA-H4 four-cylinder aircooled engine which operates on the two-cycle principle. It develops 25-30 horsepower at 2,400 r.p.m., the displacement being 432 cubic inches. The bore and stroke are 3x3 inches.

The mixture is distributed to each of the cylinders in the proper order by a special gas distributor of the rotary type geared to the crankshaft at half-time ratio. This method of mixture control avoids one of the principal difficulties experienced with the old type of two-cycle engine and as proof of this departure, it is said that the gasoline consumption of the new engine is only 0.65 pound of gasoline per horsepower-hour. The distributor also is the oil pump, forcing lubricating oil to all bearings.

There are no valves in the engine proper which adds to the merit of the arrangement and it is now being used as standard equipment on several well known French lightplanes. It weighs 64 pounds dry but fully equipped with all accessories and propeller hub.



End elevation of the French lightplane engine showing the distributor and the carburetor below it.

A New Idea for Lightplaners

FOR some time I have been turning over in my mind an idea that I am sure will aid us lightplane fans to realize our dream—the ownership of our own homebuilt *licensed* crate.

Briefly, the idea and the situation it concerns is this; Department of Commerce regulations, backed by the laws of most States, keep the lightplane builders chained to the ground. Now, instead of eating our hearts out and all that sort of thing over this situation, as most of us have been doing, let us all get together and form an association or "company," select our lightplane design, have it engineered and stressed and then approved by the Bureau for home construction.

I realize that this idea is not entirely new, that it is similar to the one practiced by the late Ed. Heath and by Corben. The main difference in their plans and the one I propose is that the cost of stressing such a ship is divided among a great number, instead of being borne by the relatively small percentage of builders who buy the ready-made approved kits, thereby reducing the cost of the plane to the home-builder.

In figures, I imagine this plane would work out something like this. According to what I've heard around New York City, the cost of stressing a lightplane is about $2000, the cost of building such a ship for test purposes, $1200; and the cost of providing and converting an automobile motor, such as the Model A or the Plymouth shown in the August P. A. is $500. Add to these figures $300, for incidental and unforseen expenses and we have a total of $4000.

For purposes of estimate, let us assume that there are 2000 lightplane fans who wish to build their own ship. If all of these were to give their support to this plan it would cost each one only about $2.00. Of course, this number may be too high, if so, the cost of participating in this plan would be slightly greater.

If and when approved, the plans of the ship selected would be available for use only by the members. The other benefits of this plan are so evident that they need hardly be pointed out. The lightplane builder would be assured that the money and labor spent on his ship would not have been in vain. He would be happy in the knowledge that his work of art would be eligible for a license.

The industry in general would benefit by the expenditure of a considerable sum for materials. The construction of 1000 ships at $500 each for material would add a half a million dollars to the industry's present income. Not a huge increase, but one to be desired.

Arrangements might be made on a royalty basis with a manufacturer who might wish to build and sell the ap-

(*Concluded on page* 403)

A Nomograph for Gross Weight

by RAOUL J. HOFFMANN

Presenting a quick and simple method of predicting the gross-weight of a proposed airplane design, prepared by a prominent aeronautical engineer exclusively for the readers of POPULAR AVIATION.

ONE of the most important estimates, which confront the amateur airplane designer, is the gross weight of the airplane.

There is scant information on weight estimate available and usually, nine out of ten are underestimated 10 percent. which consequently results in tail-heavy machines. It calls for a great sacrifice of money and performance to correct a tail-heavy machine.

A safe method to eliminate an error in the static balance of an experimental machine would be to weigh each part previous to assembly and check it with the estimate and then finish the whole machine except the motor mount and cowling. Knowing the weight of the machine we can locate the engine so that the whole airplane will balance at the required point.

The estimate of the gross weight is based on the assumption that, for similar designs, the sum of the weights of all items not included in the structure or shape of an airplane is in a fixed relation to the gross weight.

We may call these items "removable weights" which includes the weights of the powerplant, propeller, radiator, tanks, plumbing, firewall, instrument board, controls, seats, upholstery, floorboard, soundproofing, lighting, armament, gasoline, oil, pilots, passengers, cargo and all special equipment.

Investigating a series of designs we have found that the relation of the removable weights—ranging from one seaters to transport planes—to the gross weight, is approximately the same (1: 1.48). Powered gliders at present do not follow this relationship. They are slightly heavier than in the above ratio.

To eliminate mathematical operations in estimating the gross weight of an airplane, we have prepared the alignment chart shown here. By simply laying a straight edge across, diagonally, through the sum of the *removable weights* on scale No. 1 and through the point marked "*gross weight*" on scale No. 2, we will find the straight edge going through the *gross weight* on scale No. 3.

In case that we would like to know the structural weight or its component units, we lay the ruler through the same point on scale No. 1 and through the unit wanted on scale No. 2. At the lower part of the chart are the weights of the removable items usually found in an average design.

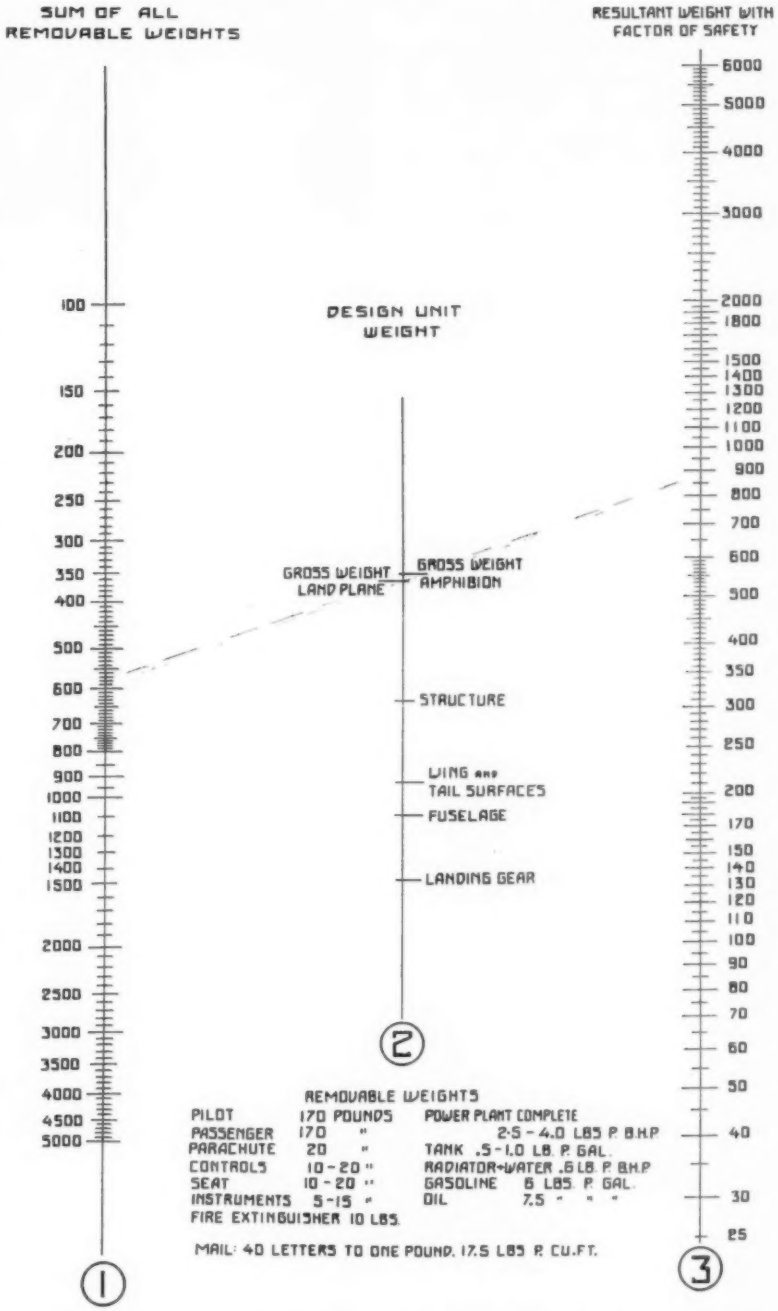
In order to illustrate the method of using the chart we will take following example. Find the gross weight of a landplane carrying one pilot, one passenger, a 35 H.P. engine with 8 gals. of gasoline, 5 quarts of oil.

The itemized removable weights will be as follows: 170 lbs. for pilot, 170

(*Concluded on page* 404)

THIS NOMOGRAPH IS THE FIRST OF A SERIES

These charts simplify and shorten the time required for making design calculations and their accuracy can be depended upon.


SUM OF ALL REMOVABLE WEIGHTS
RESULTANT WEIGHT WITH FACTOR OF SAFETY
DESIGN UNIT WEIGHT
GROSS WEIGHT LAND PLANE
GROSS WEIGHT AMPHIBION
STRUCTURE
WING and TAIL SURFACES
FUSELAGE
LANDING GEAR
1
2
3
REMOVABLE WEIGHTS
PILOT 170 POUNDS
PASSENGER 170 "
PARACHUTE 20 "
CONTROLS 10 - 20 "
SEAT 10 - 20 "
INSTRUMENTS 5 - 15 "
FIRE EXTINGUISHER 10 LBS.
POWER PLANT COMPLETE 2.5 - 4.0 LBS P. B.H.P
TANK .5 - 1.0 LB. P. GAL.
RADIATOR-WATER .6 LB. P. B.H.P
GASOLINE 6 LBS. P. GAL.
OIL 7.5 " " "
MAIL: 40 LETTERS TO ONE POUND. 17.5 LBS P. CU.FT.

Nomographic chart for computing the gross weight of an airplane from known preliminary data. The dotted line indicates the method of solving the problem given in the text.

About Gliders and Gliding

by SPEED WESTPHAL

There is most certainly a revival of interest in gliding this year as was evidenced at the Elmira Soaring Meet. Mr. Westphal will continue to give helpful information on this subject to our readers.

I HAVE just had a conference with the Editors of this magazine and have been informed that they are behind gliding and soaring 100 percent. Here is the set-up.

The sport of gliding and soaring has been hit by the depression just as has every other sport, however, there is just as much gliding being done today as there was back in the years of '29 and '30. I may even say there is more being done today, the only difference is that we don't read about it in every paper and magazine.

Back in the year 1930, a flight of thirty miles would hit the front page of every large paper in the country. Today, if some of our soaring pilots took off and didn't fly for at least a hundred miles, they would consider it a test hop and a waste of time. That proves that the sport is not dead and that progress has surely been made. The one fact that gliding and soaring is no longer on the front page, proves that it has become an expected thing in our daily life and is no longer a "stunt."

Not so many days ago, a Chicago man told me that gliding and soaring was washed up. I told him he was wrong and backed up my statement with a five buck wager (if my creditors read this I'm only fooling). My friend and myself paid a visit to the local airports where we found the following conditions.

Sky Harbor airport, which is one of the largest and best equipped fields in these parts, has been taken over by a gliding club with fifty active members. The once beautiful club house and hangar, which has been in very bad shape for the past three years, is now being cleaned and repaired. The manager of this club, only recently returned from Europe, brought with him a high priced European soaring plane which will be used for advanced student instruction.

Our next stop was at the Curtiss airport, which, outside of the city's own Municipal airport, is the most active near Chicago. Here we found a first-class gliding school being operated by Charles Abel, former holder of the glider looping record. Going over to the Elmhurst airport, located just a few miles west of the city, we discovered two more of the motorless craft.

One of these was a home-built job which has been in service since the old days and the other was a "Waco" factory built job being flown by unit number 1 of the National Glider Movement. This club was formed by it's president, Mr. Galen Asher, through the efforts of POPULAR AVIATION. The flights between these two clubs are so arranged that there is a glider in the air almost continually from early morning 'till late in the evening.

Dr. Gross and his 4-place glider which has awakened interest in the possibilities of passenger carrying soaring planes.

The Air Activities Airport, just three miles east of St. Charles, was our next stop. Here we came face to face with three gliders, namely, a very fine two-place dual-controlled job, a single-place "Northrup" primary that has really been flown and, last but not least, a "Mead" primary which is owned by unit number 2.

The latter club was also formed through the pages of POPULAR AVIATION. I might also mention here that the club's president, Harry Peterson and the treasurer, David Fink, made some fine flights on the first day out. We could have dug up at least four more gliders had we motored for another hour but my friend was convinced that the sport was very much on the up-grade.

The greatest trouble in gliding and soaring activities, as I see it, is the shortage of good gliders in this country and not the lack of interest as so many claim it to be. Many fine clubs have been formed during the past two years, however, there are many others who have been forced to disband because they were unable to beg, buy or even steal a suitable primary trainer or sailplane.

This may sound funny but you just go out and try to pick up a good licensed glider. You might as well go out to the zoo and try to talk an elephant into balancing himself on a golf ball. I assure you that one would be no harder than the other to accomplish.

There isn't one single active glider manufacturer in the U. S. that is building and selling a primary glider today. I have searched high and low and have found none on the market. In answer to the great demand for blue-prints and supplies, I believe I will have some on the market by the time this issue hits the stands and believe they will be a great help to all you fellows that have been writing to me in the past.

As for secondary gliders and sailplanes, there are only two active manufacturers that I can give you any dope on. One is Prof. R. E. Franklin of Long Shore Drive, Ann Arbor, Michigan. He is the builder of the famous Franklin "Utility." This ship sells for about $600 and is well worth the price.

The other concern is the Bowlus-Du-Pont Sailplane Corporation, Wilmington, Delaware. During the National Soaring Meet held at Elmira, N. Y., recently, Mr. DuPont informed me that his new Utility would sell for some figure very near the $1,000 mark. While both of these ships are very fine trainers and soarers, they do not fit the budget of the modern clubs and therefore they do not solve the problem of supplying the demand.

Something must be done, and that something is up to an open minded individual or concern who is in a position to turn a deaf ear to common public belief, forget that there ever was such a thing as a depression and invest sufficient capital to place a knock-down, reasonably priced glider on the market; one which may be constructed by the home-builder and still be eligible for the necessary government license.

Now that POPULAR AVIATION has announced its intentions of giving full support to the gliding and soaring world, it is up to all concerned to help support the magazine. The Soaring Society of America issues a fine bulletin each month to its members. The bulletin is chuck full of interesting gliding and soaring news from all points of the world, and serves well the fellows that are already in the game.

Actually, it does very little to create new interest and for that reason there must be a connecting link between those who are active and those who have intentions of becoming so. POPULAR AVIATION wishes to set itself up as that go-between but can only do so through the

(*Concluded on page* 396)

What Our Readers Are Building

In this department, we show and prove that all of our readers are not arm-chair pilots but that a great number of them do things, accomplish things and go places.

THIS month we are showing two very pretty jobs, not only pretty but well performing lightplanes built by our readers. If there is anyone who believes that good lightplanes cannot be built by amateurs we advise him to take a good look at these jobs.

First, are two photographs of a lightplane built by Louis D. Rutter, Marshall, Mo. It took Mr. Rutter two years to build it, and at the time of his writing, he had been flying it about five months. He is more than satisfied with its performance and he should be, for it has a top speed of 120 m.p.h. and a landing speed of 35 m.p.h.

It has a wing-span of 24'-0" and weighs 375 pounds, empty. The wing-loading is 6.0 pounds per square foot. We are particularly taken with its neat appearance and with the high degree of workmanship shown in its construction. Mr. Rutter is to be complimented upon his accomplishment.

Last, but certainly not least, is a three-year old Pietenpol type built by Dick Melcher and F. S. Salisbury of Sparta, Wis. According to Mr. Melcher, "she carries two people like nobody's business". During this time, the ship has had about 150 hours of flying during which time the wing was smashed.

The owners of the plane were particularly fortunate in having an old emergency field available for flying last summer, which solved the greatest problem that the amateur is generally required to face.

This is a regular Pietenpol plane, except for the rounded wing tips and changes in the wing-struts. It is powered, as usual, with a Ford engine which has given the boys every satisfaction in the way of performance. They strongly recommend that the amateur builder should take some flying instruction before starting out with a new ship. If they had followed this advice themselves, they would not have smashed the wing.

Looking at this ship makes us wonder just how many Pietenpol ships have been built and flown. We have shown a great number in this column and the number shown is probably a small percentage of the total built. They have been built over a long period of years and have proved staunch true ships.

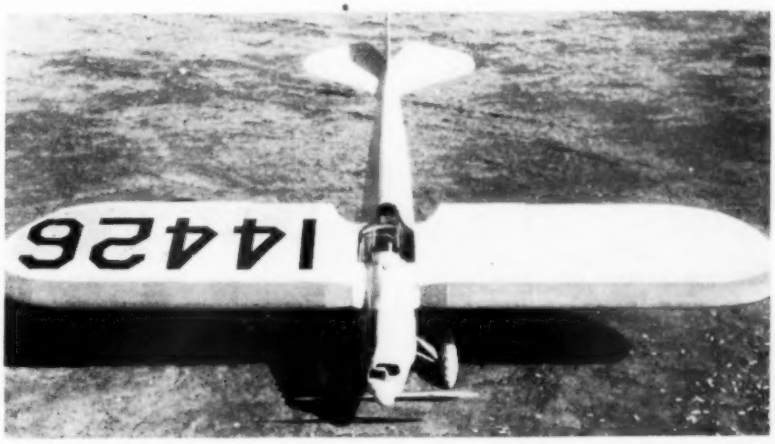
just how many Pietenpol ships have been

Next to these ships are the little planes powered by motorcycle engines, such as the Heath, Church, etc., that have been built in flocks.

In our next issue we will endeavor to double the space occupied by this department so that we can bring our pictures up to date. The pix have been coming in so rapidly of late that we will have to step on it to keep abreast of the contributions. But, please remember, this does not suggest that you hold back on your contribution. Just send it in and we will run it if it takes three pages per issue.

Just Look Them Over and See Real Jobs

This sweet little job is the handiwork of Louis D. Rutter. She is sure a fine looking ship with pantsies and everything. Pay particular attention to the cooling tunnel.



We are now looking down on the top of Mr. Rutter's production which shows her to be a trim slim ship having excellent lines. This job comes from Marshall, Mo., which is an air-minded town.

This Pietenpol plane was built by Dick Melcher and F. J. Salisbury, a dandy little ship that is about three years old and which has had over 150 hours. Mr. Salisbury is standing by the plane.

XUM

Lincoln Receives Approval for Mechanics

THE Lincoln Airplane & Flying School of Lincoln, Nebraska, which has been training mechanics for the past 25 years, has received Government Approval of a mechanics' course. Its graduates, upon completing the mechanics' course, are eligible to make application for their Government Mechanics' License.

The Lincoln Airplane & Flying School has for a number of years operated as a Transport Government Approved Flying School. This is one of the oldest and most successful schools of its kind and has among its students many young men from foreign countries.

A special feature of this school is the part-time employment it offers its students in turn for board and room while they are preparing for their Government license. Extension training at Lincoln is offered also both in English and Spanish.

There are now approximately 200 students enrolled in all branches.

A New De-Icer

THE latest thing in the way of de-icing equipment is a new electrically wired fabric for covering airplane wings.

Fine copper wires are woven into the fabric and electrical charges are sent through them at frequent intervals. These charges form sufficient heat to melt ice as soon as it forms.

Here's One From California

IRWIN OHLSSON, Los Angeles, Calif., built both the engine and the model plane shown here. It weighs 15 ounces and flies 6 minutes on ½ ounce of gasoline.

Mr. Ohlsson is assisted (in the picture, at least) by Kathleen Burke, a movie actress of Los Angeles. This is one of the advantages of living in California, there's always a nifty screenine to pep up the picture. She adds to the background as one might jolly well say.

The Ohlsson plane receives an expert inspection.

A Rotary-Valve Model Gas Engine

W. E. Atwood and his gas powered model plane, equipped with the new "Baby Cyclone" rotary-valve engine. This plane won the California state meet this year, flying out of sight at the end of 4-minutes, 58-seconds. It was officially timed for 9-minutes.

THE rotary-valve system of carburetion is incorporated in a new miniature engine that makes its initial appearance in the market this month.

The engine, known as the "Baby Cyclone," is the development of W. E. "Bill" Atwood, a nationally known model builder, and is being produced by Aircraft Industries, operators of Grand Central Air Terminal and the Curtiss-Wright Technical Institute of Aeronautics at Glendale, California.

For the past several years, the rotary-valve principle has predominated the field in marine outboard engines, but so far as we have been able to ascertain, this is the first application of the design to engines used for model aircraft.

Atwood, designer of the engine, has been working with rotary-valve model engines since 1929, starting at a time when the rotary-valve principle adapted to marine engines was experiencing an early success. Prior to turning his attention to the development of model engines, Atwood had had several very successful years experience in model airplane and glider construction and flying.

His first model engines, however, were a little too heavy to be used to power model airplanes and they were mounted in model boats. Powered by his engines, Atwood's boats won every model marine event in which they entered and one of them established a model boat record of 31 miles an hour.

Continued development of the miniature gas engine resulted in the construction of an efficient model airplane power plant. In 1932 a model plane built by Atwood and powered by one of these engines made a flight at March Field of 26 minutes and 23 seconds, winning nationwide recognition.

A development of this original engine won the California state model contest at Sacramento last year with a flight of one hour and three minutes and has consistently been turning in good performance at all recent meets and demonstrations held on the Pacific Coast.

The performance of the engine because of its reliability, economic operation and simple construction, won the interest of Major C. C. Moseley, former World War ace and army test-pilot and now Curtiss-Wright representative on the Pacific Coast and president and general manager of Aircraft Industries.

Major Moseley saw great possibilities for the little engine if produced commercially so as to make its use available to all model builders. Backed by Major Moseley during the past year, Atwood has made improvements to the engine to further simplify its construction and make it foolproof for the use of the most inexperienced operator.

The "Baby Cyclone" has undergone an exhaustive series of tests and is finally ready for distribution. Several times during the last few months production of the little engine was delayed due to the high standards set by the builders, the engine had to be perfect before offering it to model builders.

THE BABY CYCLONE ENGINE
General Specifications.

Bore—¾".
Stroke—13/16".
Speed—Variable, from 1000 to 5000 (depending on pitch of prop).
Weight, complete with batteries—15 ozs.
Cylinder and Piston—Special electro-furnace alloy iron ground and lapped to within .0003.
Cylinder Head—Duraluminum, screwed on.
Wrist Pin—Ground tobin bronze.
Crank Shaft—Nickel steel drilled from both ends ⅜"x1⅛" bearing surface. Positive rotary valve integral with shaft.

(*Concluded on page 394*)

Building "Mr. Mulligan"

by PAUL W. LINDBERG

Model Editor and Model Designer
for Popular Aviation

Mr. Mulligan, on a small scale, greets you. This is an exact flying replica of the 1935 Thompson Trophy winner, a beautiful model and one that gives an excellent flight.

THIS ship won the Thompson trophy at the 1935 National Air Races. We know you will find every minute interesting constructing this trim little racer. It is equipped with several interesting features; shock absorbing landing-gear and movable controls which carry aluminum hinges. This is a ¾-inch flying scale model and all details carried on the large ship are carefully worked into the model.

COLOR SCHEME

Entire model—white.
All details—black and silver.

CONSTRUCTION OF FUSELAGE

First, place waxed paper on top of plan to prevent parts from sticking to it. The fuselage sides are built from 1/16-inch square balsa. The longerons, verticals, diagonal braces, etc., are held in place until securely cemented. This is done by inserting straight pins on either side of strips wherever needed. When the two sides are completed, the crossmembers are cemented into their proper locations. Cement a 1/16-inch by ⅛-inch piece of balsa to rear of fuselage to obtain the correct width. Check carefully front to rear for alignment.

Cut the formers from sheet balsa and cement in their respective positions. Refer to plan. The sides and top of fuselage are flat. Formers are cemented to bottom and front part of fuselage. Stringers are run over bottom formers. For positions, see plan. Stiff paper is required between ⅛-inch thick balsa nose plate and formers 1, 2 and 3. Refer to photo of framework.

CONSTRUCTION OF MOTOR

The cylinders are carved and sanded from balsa blocks. When nine cylinders have been formed, wind heavy thread around them to represent fins. Make crankcase from several pieces of balsa. Rocker arm housings, push rods and other small details of motor are made of balsa.

CONSTRUCTION OF WINGS

To obtain the correct angle between rib F and wing tip, the wing spar and the leading and trailing edges must be cut at rib F.

CONSTRUCTION OF ELEVATOR AND RUDDER

Elevator and rudder fin are made from 1/16-inch square balsa and constructed on the plan. The lower part of rudder curves outward as shown on former 11, to be of the same cross section as rear of fuselage. Cover between formers 11, 13 and 1/16-inch square cross brace with stiff paper. Also cover with stiff paper between former 12 and bottom of fuselage.

CONSTRUCTION OF LANDING GEAR

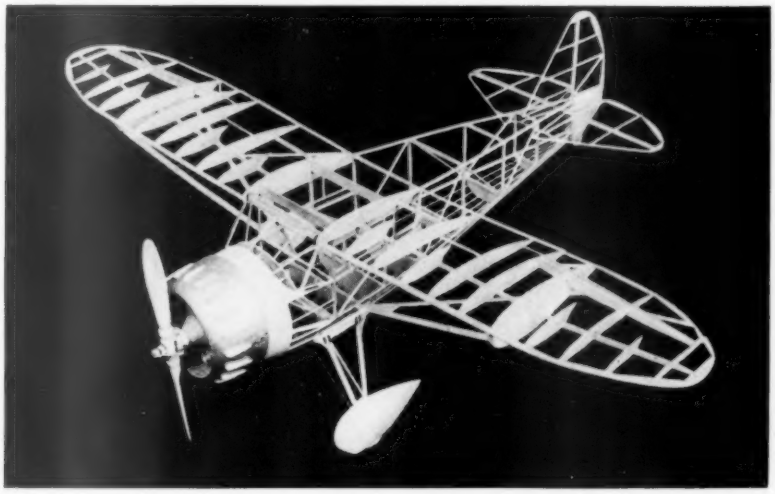
After the struts have been cemented together, cement them to the streamline wheel coverings. The wheel coverings are carved from three pieces of balsa and cemented together. Details on plan clearly show shock absorbing arrangement. The model can be built with or without shock absorber; however, we recommend the shock absorber because it prevents damage to undercarriage when landing.

COVERING THE MODEL

Apply tissue to the various framework members, using a light grade of model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When edges have dried, apply coat of water to tissue. When all water has dried completely, tissue will become taut. May we suggest that you pin wings, elevator and such to flat surface. This prevents warping.

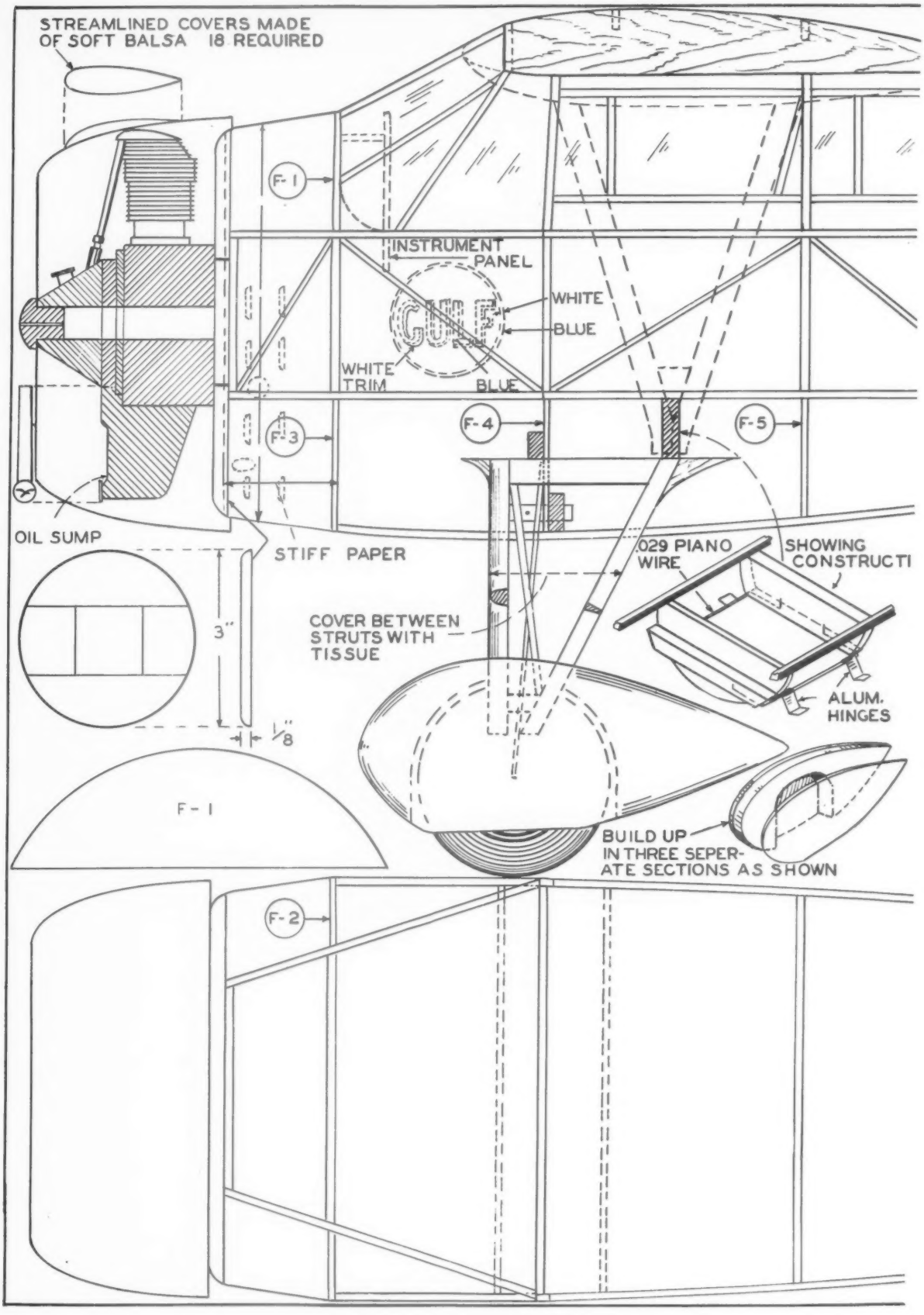
ASSEMBLY

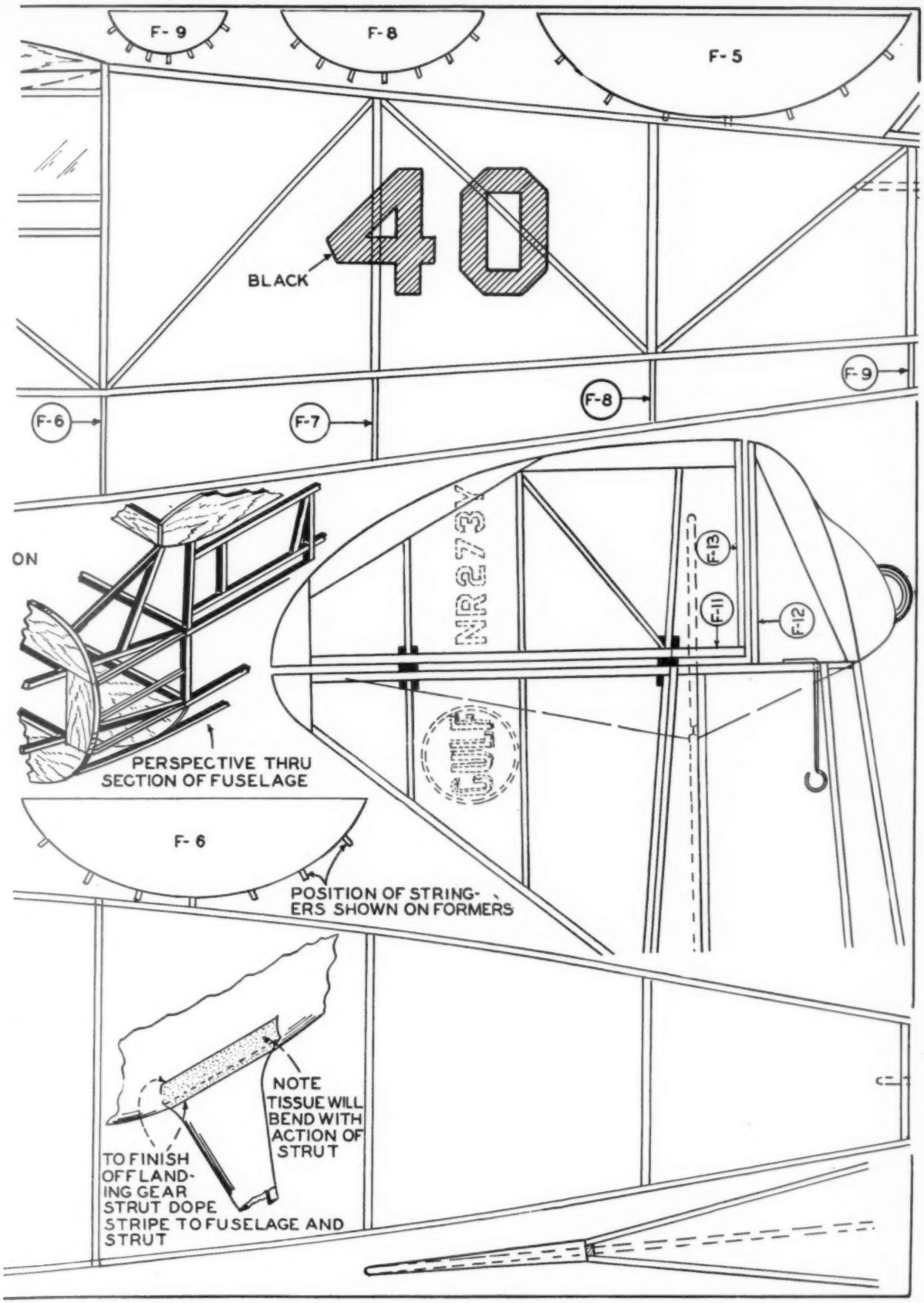
After the various parts have been covered, wing panels can be cemented into position. The wing struts are next; these are faired into wing with a streamline fillet made of balsa and stiff paper. The elevator and rudder are cemented to rear of fuselage.

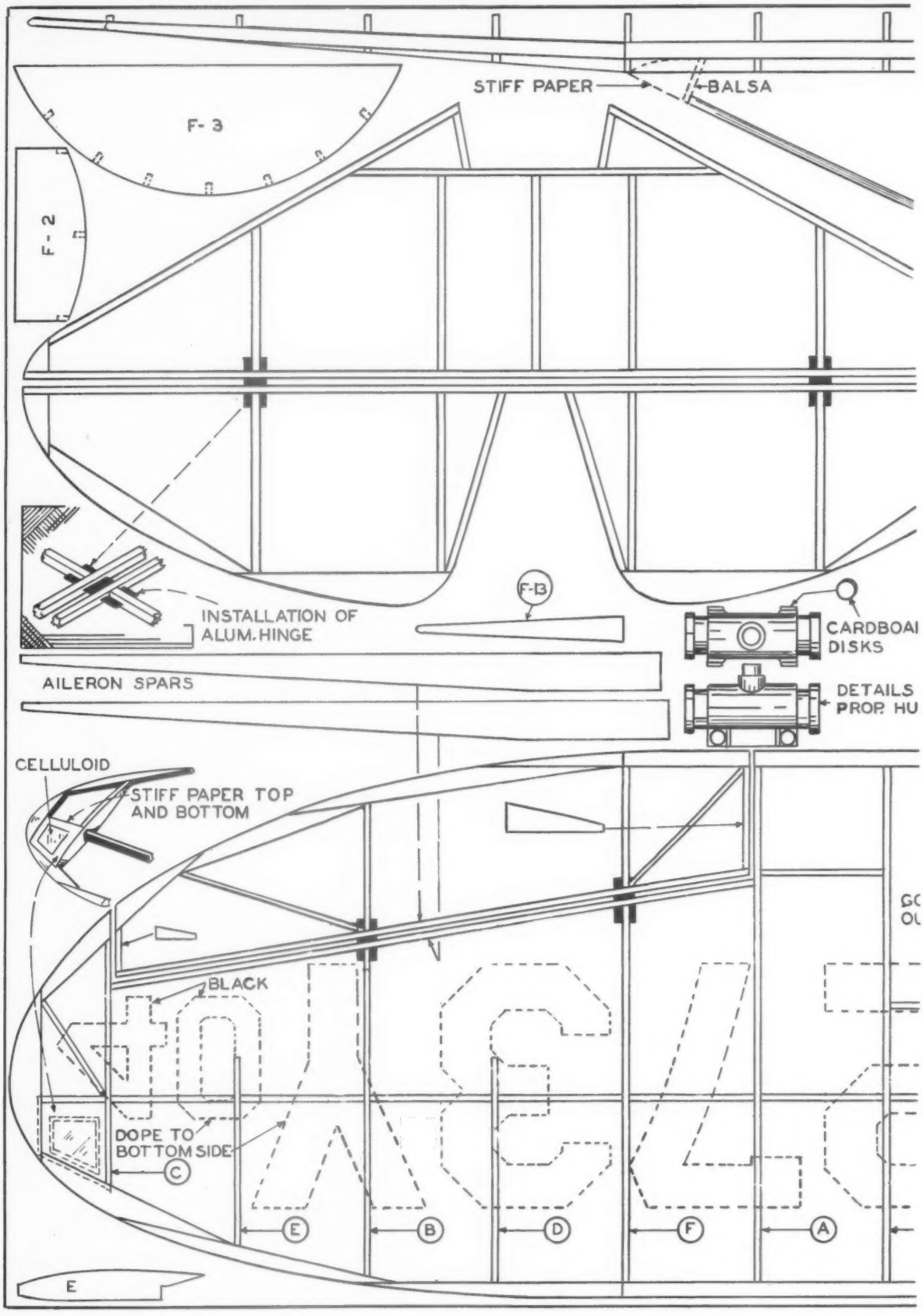


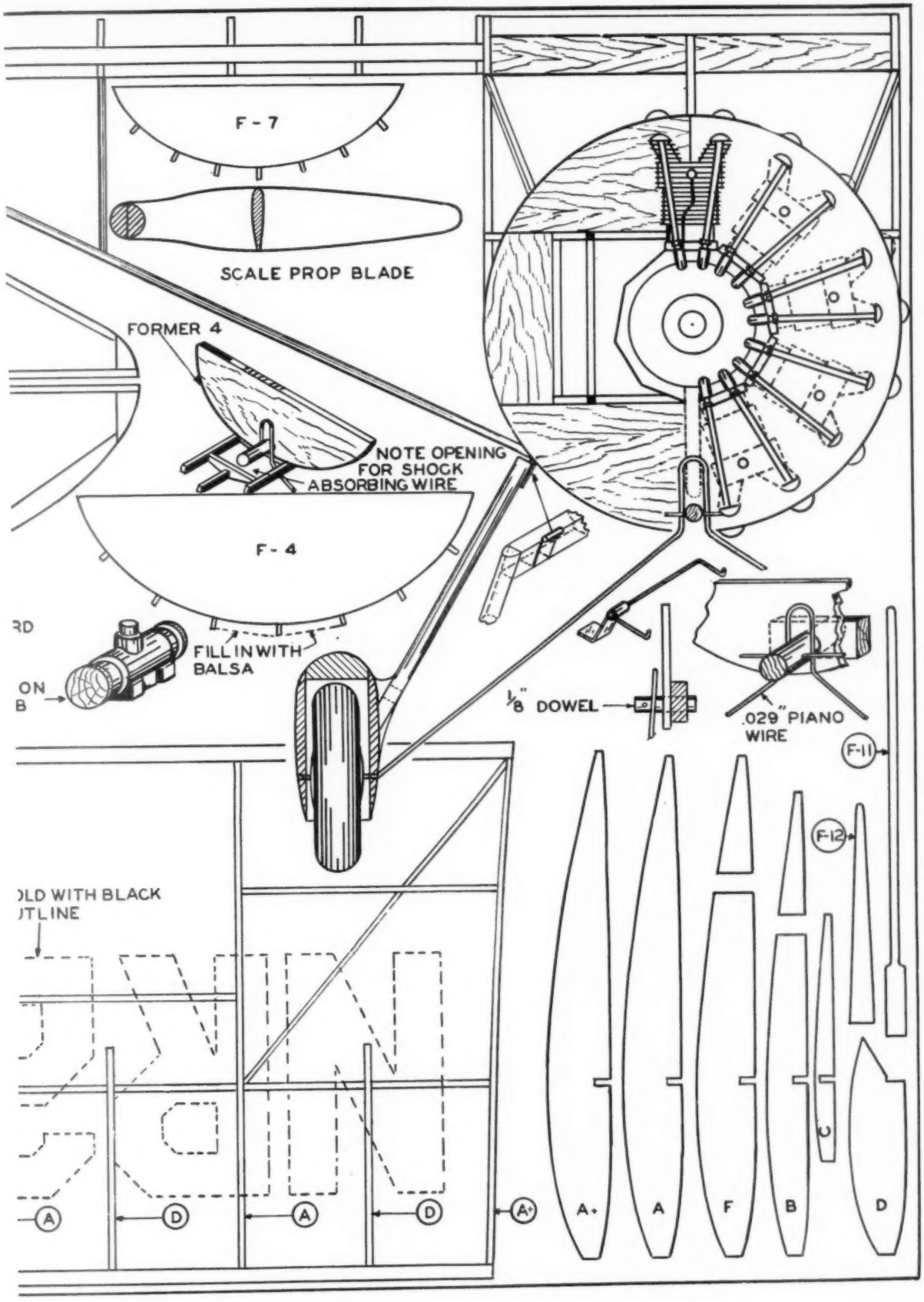
Mr. Mulligan before receiving his overcoat. This photograph assists in an understanding of the drawings.

XUM


STREAMLINED COVERS MADE OF SOFT BALSA 18 REQUIRED
F-1
INSTRUMENT PANEL
WHITE
BLUE
WHITE TRIM
BLUE
F-3
F-4
F-5
OIL SUMP
STIFF PAPER
.029 PIANO WIRE
SHOWING CONSTRUCTI
COVER BETWEEN STRUTS WITH TISSUE
3"
1/8"
ALUM. HINGES
F-1
BUILD UP IN THREE SEPER-ATE SECTIONS AS SHOWN
F-2


F-9
F-8
F-5
40
BLACK
F-6
F-7
F-8
F-9
NR 9733
F-13
F-11
F-12
ON
PERSPECTIVE THRU SECTION OF FUSELAGE
F-6
POSITION OF STRINGERS SHOWN ON FORMERS
NOTE TISSUE WILL BEND WITH ACTION OF STRUT
TO FINISH OFF LANDING GEAR STRUT DOPE STRIPE TO FUSELAGE AND STRUT


STIFF PAPER
BALSA
F-3
F-2
F-13
INSTALLATION OF
ALUM. HINGE
CARDBOAI
DISKS
AILERON SPARS
DETAILS
PROP. HU
CELLULOID
STIFF PAPER TOP
AND BOTTOM
BLACK
DOPE TO
BOTTOM SIDE
C
E
B
D
F
A
E


F-7
SCALE PROP BLADE
FORMER 4
NOTE OPENING FOR SHOCK ABSORBING WIRE
F-4
FILL IN WITH BALSA
1/8" DOWEL
.029" PIANO WIRE
F-11
F-12
A+
A
F
B
D
A
D
A
D
A+

—And Here Is One From Kansas City

W. Davis displays his fine gas-powered model. It is a sturdy looking job—well constructed.

W. DAVIS, 3008 31st St., Kansas City, Mo, sends us this photograph of his 6-foot gas-powered model, but fails to give us much detail concerning its construction or performance. But anyway, a close scrutiny of the original photograph shows that it is very neatly constructed.

It is powered with a Brown, Jr., engine which is entirely enclosed with an air-tunnel and port as shown. It would be interesting to discover just how effective this sort of cooling is and whether it will prove practical for the majority of model designs. We hope to hear more from this builder in the future.

Joseph Neigel's Gas-Powered "Miss Fairlawn"

JOSEPH NEIGEL, 8 Park Ave., Fairlawn, N. J., sends us dope and a photo of his gas-powered model, "Miss Fairlawn". With this model, Mr. Neigel placed second at the Eastside Aero Club Contest with a flight of three minutes, four seconds, in a pouring rain. He says that there was hardly any gliding period due to the fact that the ship was water-soaked, but that there was only seven seconds difference between Miss Fairlawn and the winner, the Ehling 57. The following are the general specifications:

SPECIFICATIONS OF MISS FAIRLAWN

Wing Span	8'-0"
Chord	15"
Area of wing	9-sq. ft.
Wing section	Clark Y
Aspect ratio	8:1

This is "Miss Fairlawn", the handiwork of Joseph Neigel. He placed second at the Eastside Aero Club contest.

Gas Model Plane Society Formed

THEY have been doing big things in Chicago in the way of a new gas powered model society that is devoted exclusively to gas-powered model problems.

This is the Central Gas Modelplane Society, or the "CGMS" as it is familiarly called. Very remarkable progress has been made in the organization and it stands unique among model clubs the world over.

First of all, after two months of life, it now numbers 42 active members and, what is more, there are 42 gas propelled models now completed or under construction. This is probably a greater number of this type of model than is owned in any other club of any kind.

The following list of officers were elected for the CGMS, all of whom have had extended experience in the model field and in the conduct of model meets.

P. J. SWEENEY, president: a World War Air Service veteran and member of Aviation Post 651, American Legion.

J. V. MOFFET, Secretary.

CARL GOLDBERG, Treasurer: World's Champion model builder and holder of many records.

This club is designed for gas model airplane builders over the age of 16 years. The membership of men and boys of or over this age is earnestly solicited. Meets will be held and much promotional work will be done to advance the status of the model gasoline engine and the model airplane that it propels.

Regular meetings are held in the American Legion rooms at the Sherman Hotel, Chicago, Ill., but it should be understood that this occupation is simply a courtesy extended by the Legion to the newly formed society and that the Legion has nothing to do with the administration of club affairs. The society meets on the second and fourth Fridays of every month.

ATTENTION. Mr. Sweeney tells us that the CGMS has a great big surprise in store for all interested in gas models. Watch for the announcement of this outstanding offer in the January issue of POPULAR AVIATION. This is not a membership offer—it is a way to do something that you have always longed to do. Watch—wait—listen.

Heath to Move

WE have just had word from the officers of the Heath concern, that they intend to move to Dowagiac, Michigan, where they will continue their parts business and manufacture lightplanes.

Probably more Heath lightplanes have been constructed in this country than any other type and a great number of Heath B-4 engines have also been used, both on the Heath and other lightplanes.

Low cost, simplicity and easy payments have combined to give the ship its deserved popularity. We will watch with interest, further developments by this company.

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FAMOUS SUPER-DETAIL MODEL SHIPS!

Build the NEW Super-Detail Model Italian Liner, REX

29"—scale 1/32" to the foot. Patented Hull Design Shaped hull and over 100 metal fittings. 24 cast metal lifeboats; 24 cast stairways; 2 cast anchors; 4 metal propellers; 6 cast bits; 48 metal davits. The Rex comes in beautiful high luster original colors of black, orange, white, red and green; and the kit also contains turned wood parts, printed wood, cement, wood filler, sandpaper, etc. **postpaid** **$6.00**

REX PLAN

Full size plan—scale 1/32"—sheet 34" x 44"—full instructions—7 photos—25 detail views. Everything included complete, **only 25c postpaid.** Regular value $1.00.

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The newest, fastest ship afloat. Beautiful new French liner.

Scale 32½" model 1/32" to the foot. New, patented hull design.

Here is a dream of a boat model that you will want to build. Normandie has a shaped hull and over 100 metal fittings—over 1000 portholes—60 metal davits—30 life boats—16 winches—24 cast metal stairways. Comes complete with all the beautiful, original high luster colors, cement, full size plan, turned wood parts, printed wood—printed fiber patterns, and everything complete that is necessary to build this model.
Postpaid **$7.00**

NORMANDIE PLAN

Full size plan—scale 1/32"—sheet 34" x 44"—full instruction—7 photos—25 detail views. Everything included complete, **only 25c postpaid.** Regular value $1.

NEW IDEAL TRU-CUT NIFE

The IDEAL knife for building models—Tru-Cut Nife. Send for this new, keen, patented, razor-edged knife. Securely fastened to a long holder it can follow intricate curves; cuts balsa like butter! Excellent for every cutting purpose. **15c postpaid. Extra blades 3 for 10c.**

DEALERS. Write for attractive advertising proposition with your name imprinted on tru-cut nife without extra cost.

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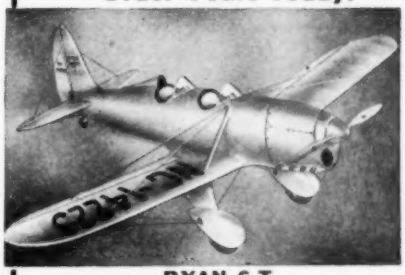


RYAN S T

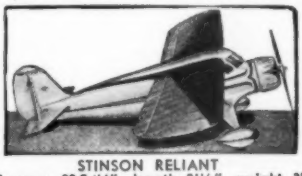
Wingspan 22½", length 16½", weight 2½ oz., scale ¾". New fast Ryan has dual control system which operates in either cockpit; adjustable wing flaps; plans for making an actual working engine—4 cylinders with movable pistons, carburetor and spark plugs.
Complete kit **$1.50**

BOEING P-26A

Wingspan 21¼", length 18", weight 2½ oz. Exact ¾" scale. This flying model is an exact replica of the famous fighter—one that is identical in all but size with its noteworthy big brother. Beautifully colored in olive drab and yellow. All Super-Detail parts included. Kit complete, postpaid **$1.75**

CURTISS GOSHAWK

Wingspan 23⅜", length 16¾", weight 3⅜ oz., exact ¾" scale. Coated with new IDEAL high lustre finish, with silver, yellow, red and black coloring. Kit complete, postpaid **$2.00**



STINSON RELIANT

Wingspan 32 5/16", length 21¼", weight 3½ oz., exact ¾" scale. Adjustable speed arresters built into the wings, movable cabin doors, complete interior with four seats and control column, and all the other Super-Detail features. Colored in bright contrasting yellow and black. Kit complete, postpaid **$2.50**

MARTIN BOMBER

Wingspan 35", length 22½", weight 4⅝ oz. Exact scale. Retractable landing gear, rotating gun turret, movable machine guns, special streamline cowlings, two types of 3 bladed propellers—one for flying and one for exhibition with removable motor sticks for flying; rudder and elevator balanced surfaces; new type freese ailerons. Kit complete, postpaid **$3.50**

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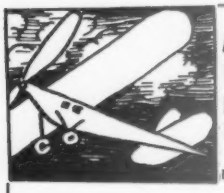

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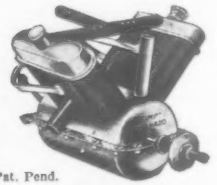

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Airmail

(*Continued from page 354*)

Edgerton would catch a glimpse of the ground and know where he was.

As he passed over Havre de Grace, there suddenly loomed up dead ahead a church steeple. He was right on it before he saw it. He banked for all he was worth, standing the old crock right up on her ear, and missed the steeple by a miracle.

But the crowning thrill of the day came a little later as he passed the Army Proving Ground at Aberdeen.

"We were flying at an altitude of about 150 feet," Edgerton recalls. "Visibility was practically nil. Suddenly there was a terrific bump, almost as violent as if the plane had struck something. That afternoon, Army authorities at Aberdeen call d up and said that an airplane had flown over there and almost collided with a shell fired from a 16-inch gun!"

Is it any wonder that Edgerton's hair has turned slightly gray?

On another occasion, Jim got caught in a vicious summer thunderstorm over Baltimore. He was flying his faithful old mount, No. 38274. The turbulent air tossed the frail wooden Jennie about like a chip on a rough sea. One instant her nose would be pointed straight toward heaven and the next instant Jim would see the ground rushing up at him just over the engine cowl. He needed spurs and stirrups to ride that crate, for she was bucking like a bronco in a wild west rodeo. Peals of thunder drowned out the roar of the Hisso engine and blinding flashes of lightning cleaved the sky about him.

Suddenly, he saw gasoline begin to leak from the tank which was carried just below the top wing between the center section struts. In several places along the edge of the tank, streams of fuel about the size of a lead pencil were spurting out. Soon the whole forward part of the fuselage was saturated.

Jim watched the lightning playing about the metal parts of the plane and waited for the spark that would blow him to shreds and spatter him all over Baltimore. But Lady Luck was riding with him again and the spark never came. He rode out the storm and brought those precious letters in right on the stroke of the clock.

Baltimore almost proved to be Jim's jinx. A few days later he was pushing the mail over the Maryland metropolis when suddenly, above the steady drone of the engine, there was a high-pitched metal twang like a guitar player tuning his instrument. One of the drift wires, which extended from the nose of the plane to the struts to keep the wings from buckling, had broken and was dangling almost in the shining arc of the propeller. If it became entangled in the prop, it would shatter it to a million splinters and probably tear the engine loose.

Throttling down, Jim maneuvered as best he could to keep wire and prop from that fatal embrace. Below him were plenty of flat broad fields into which he could have glided. But that would mean delaying the mail, so the plucky youngster kept going and finally sat down safely in Washington.

Altogether Edgerton made fifty-three trips and never failed to bring the mail through on any of them. On only one did he have a forced landing.

He was over Camp Meade, Maryland, when a magneto shaft broke. There was a terrific jolt that almost jumped the engine out of the ship. For once, Jim had to come down and come down in a hurry. He looked below him and his heart stood still. He was plunging straight towards the heads of hundreds of marching men on parade!

Lower and lower sank the helpless Jennie. Edgerton flattened his glide as much as he dared and tried to squeeze over the soldiers. He was almost knocking their hats off, but still the Yanks continued to hold their ground.

"I just skimmed over their heads and landed on the very edge of the parade ground," Jim laughingly relates. "It was my old outfit and they certainly gave me a welcome."

It was just a bit demoralizing to the military discipline of the parade to have an airplane drop down out of the sky and land in its midst. And then to find that it was piloted by one of the old members of the organization indeed called for a rousing greeting. Jim got it all right, but immediately set about to repair his engine and then pushed on.

On August tenth the Army's airmail days came to an end and it turned the flying of the mail over to the Post Office Department.

END.

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"The more difficult phases of fuselage building have been eliminated by your original moulded process." Signed, Geo. F. McLaughlin, Editor.

JOHN CARISI

"This new process definitely solves the model builder's many and difficult problems of construction." Signed, John Carisi.

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"Beyond the importance of this process as a practical means of simplifying model building is the fact, that before long full sized airplanes will be fabricated on a similar but enlarged basis. The familiarity of the American youth with this moulded process, will pave the way for its early application to full size aircraft." Signed, Vincent Burnelli.

Simple as ABC

A—Fit together and cement the two moulded parts of the fuselage.

B—Cut away the border of excess fabric.

C—The result is a perfectly shaped fuselage in the form of a hollow shell, very strong and indestructible.

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Gates Circus

(*Continued from page 360*)

and Syd Chaplin's Field were in the limelight.

Airplanes were beginning to become plentiful in 1920. Uncle Sam began releasing the JN4-ds for $900 each. The Standards weren't as yet being released. The British Export Company began releasing its war combat planes, the Le-Rhone—Avros, Bristols, Spads, Camels and Snipes. Some war pilots were getting the flying fever and buying planes.

When Pangborn felt better, he dropped over to see Hennessey and suggested they team up and wander north. Hennessey agreed that business in San Diego was not so hot. Hennessey was flying an old N-9 which closely resembled the Jenny except the overhang of the top wing was considerably shorter than that of the Jenny. They worked toward San Francisco playing every important town over which they flew. They worked on a 50-50 basis, Pang walking wings and promoting and both flying passengers.

They drifted toward Durant Field where they overhauled. The state and county fairs considered aviators were feature attractions and in exchange for a good wingwalking show, they would get exclusive passenger carrying privileges with a guarantee of $150 or so.

The contract for the state fair at Sacramento yielded them $2,000. They had beat Locklear and Wilson to it. Pang damaged a wing in landing and it cost him $60 to have it repaired and $50 more for rental of another ship.

They worked toward Red Bluff, California, where they came to the parting of their ways. Pang went on to Yreka, Cal., alone, for the county fair there. He got pneumonia and after tying the Jenny to a stump, went to bed for three days. When he was well enough to emerge he found it was snowing. The winter of 1920-21 was in full swing. He stayed in Yreka for several months, once in awhile flying into Frisco for something to do. One day he flew a sick resident to a hospital.

A good many of the barnstormers of 1920 had gone broke. Crackups, poor fields and lack of publicity caused their downfall. Pang managed to hang on.

In 1921, the government began releasing its Standards powered with Hall-Scotts. Only pilots changed to American Hisso's because of the tendency of the Hall-Scott to overheat and catch fire.

The Jenny wasn't so lily-white any more and was showing signs of being fed up. Pang was down to a scant few cents, so he overhauled the Jenny and financed the dope and paint by flying a fan to Frisco when it was finished. Pang was fast becoming known as the world's premier upside-down flyer and consequently earned the name of "upside-down Pang." He gained the rep because he could fly his Jenny on its back for two miles (without the use of the engine as OX-5s barely turn over upside-down). Pang flew more consistently on his back than most flyers flew right side up. He was so adept at this that he had his name printed on the top wing as that surface peered more at the ground than the bottom wing.

Ivan R. Gates, veteran promoter, staged an airmeet at Woodland, Cal. Airmeets were the center of attraction and were voiced more than principal football games. Pangborn wrote to the promoters for information and received word that the field was to be lighted at nights in case anyone wanted to come in after dark. This, however, was just a stunt of the publicity department. Night flying was little heard of.

Pang decided to fly in after dark. He roared over the town long past sundown. The promoters did not have the field lighted. Pang circled the town several times, his motor sending people to the streets. A stream of cars darted for the airport. The direction then was easy. He picked what he thought was the field, it was actually a golf course. The next morning he was surprised to see the Jenny on the golf course, and noted that he narrowly missed a row of trees. The tread of his tires showed plainly in the soft ground and at one point had rolled a scant few inches from a sand trap.

At the meet, he gave the Jenny all she had and won a race. The prize was $75. He caught up on a few meals he had missed. At this meet, Pang met Ivan R. Gates who was perhaps the "tops" so far as promoting was concerned.

(*Continued on page 404*)

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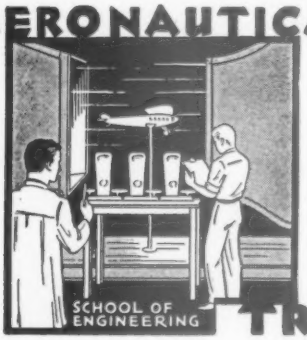

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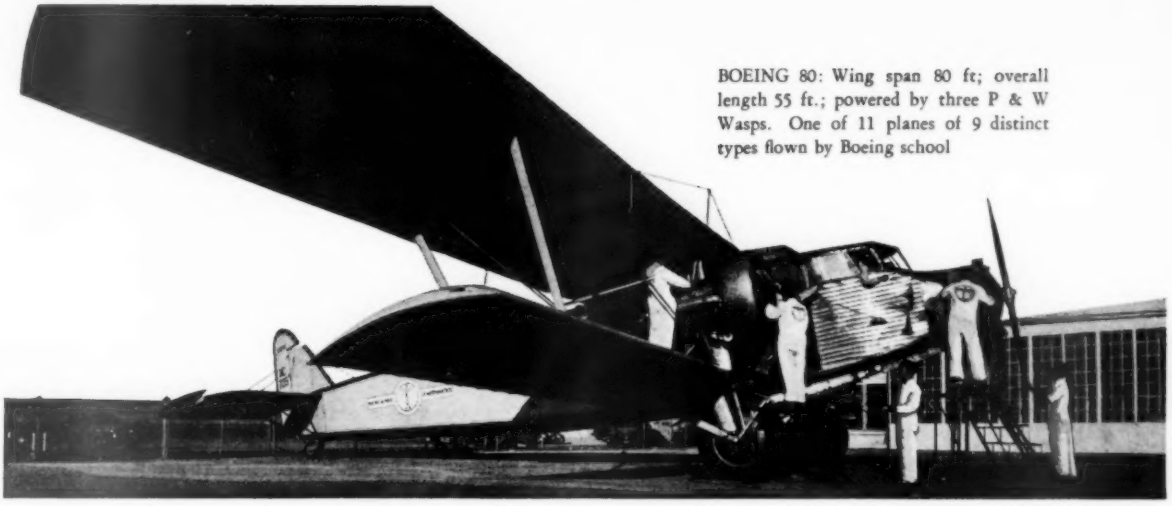

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Erwin

(*Continued from page* 358)

white. On and on he played. And thus his superb interpretation, his young soul, carried him and his listeners to great heights, to a new meaning of life and death, and then back through long war-months to linger "at home" with loved ones close at hand.

He ceased playing abruptly. His head went forward on crossed arms and his shoulders shook. Erwin, the greatest observation pilot of the American Air Service—the fighter, the gallant warrior, the brave soldier that had flown deliberately into the face of almost certain death countless times—was sobbing. Weeping like a broken-hearted child.

Perhaps he sensed that his dreams of becoming a concert pianist were never to be fulfilled. Aviation was to claim him. And as they watched, the eyes of war-hardened airmen also grew moist. Erwin, by his playing and his unabashed weeping, seemed to have cleansed their souls, warmed their hearts, gave them spiritual food. Ever after they held "Lone Star" Bill somewhat in awe and the highest of esteem.

* * *

ERWIN'S biggest flight was during a photographic mission with Lieutenant Spencer some five miles behind the German lines. While Erwin held the ship's course true as a die over the objective, at 3,500 meters, so Spencer could take urgently needed photographs, the Americans were cut off from all angles of escape by ten Fokkers swarming down upon them.

With dangerously calm courage Erwin took a desperate chance. He sent his Salmson through a hail of Spandaus lead straight at the leader of the enemy formation. The Hun pilot, in the lighter, speedier Fokker, was certain the pilot of the heavier ship would pull out of his mad attack. Instead Erwin pulled his machine gun trigger. A burst of Vickers bullets found their mark. The Fokker sideslipped under Erwin's left wing and went plunging to earth.

The remaining nine Fokkers closed in like hounds on a fox from all sides. An avalanche of bullets ripped and tore through fuselage, wing and tail fabric. The sky was filled with lead.

"I'm shot!" Spencer shouted and dropped into his cockpit badly wounded.

At the same moment Erwin became aware that a bullet severed his rudder control. Maneuvering was impossible. His ship went into a tailspin. The sudden lurch threw Erwin's head against the instrument board and knocked him unconscious. The German pilots, certain the OB was out for good, did not follow.

Two-thousand meters down Erwin regained consciousness and barely 500-meters above the ground he regained control of his ship. By skillfully flying in a lopsided position, using the elevators to do double duty as rudder and elevator, he succeeded in nursing the battle-torn ship back to the airdrome. He sent the ship to the junk heap and took Spencer to the hospital.

Erwin's last battle on Nov. 3rd, was also the most grueling of his many narrow escapes. He had to fight as a pilot to escape death in the air and fight as a doughboy before he succeeded in escaping from being captured by the Germans.

Against the advice of experienced officers, Erwin and Baucom volunteered to make a reconnaissance to locate the enemy troops and machine-gun nests that were delaying the American advance and causing severe casualties near Sedan. Hedge-hopping through a steady devastating anti-aircraft machine-gun fire the Yanks secured the valuable information required by Division HQ.

Then the Yank flying-fighters decided to return to the lines and strafe the machine-gun nests. Fighting like Demons from Hell, they broke up a number of crews in short order. Behind the Huns' lines an Anti got the Spad's range and shot it up so badly that Erwin was forced to put her down.

By skillful flying he managed to land the battered crate on rocky land without injury to its occupants.

German soldiers came pouring out of fox holes and trenches to capture the two fallen Americans. But they kept their machine guns going with such accurate aim that the Huns, attacking repeatedly, were held at bay.

When their "ammo" had become exhausted, Erwin and Baucom, armed with only pistols, ran for it to a deserted enemy emplacement. Here they found potato masher grenades. Under constant fire and defending themselves with pistols and grenades, they made their way across a mile and a half stretch of No Man's Land to the American lines. Soon they had reported more valuable information.

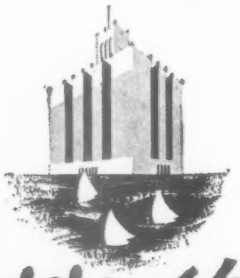
Both Erwin and Baucom were awarded oak leaf clusters to wear with their Distinguished Service Crosses.

Following the war aviation continued to hold Erwin's attention. It was in his blood. He rose to the rank of Captain. August 16-17, 1927, the Dole Prize Race for a purse of $25,000 was flown from Oakland, California, to Honolulu, Hawaii. "Lone Star" Bill Erwin, now stocky and round faced, planned to participate in the long over water hop, but was forced out at the last minute due to mechanical trouble.

On the 17th, the world was shocked to learn that the plane, "Miss Doran," named after a young pretty Indiana school teacher aboard as a passenger, with John Auggy Pedlar and Vilas A. Knope, had crashed into the ocean. Also another plane was unreported.

Erwin, experienced at reconnaissance work, determined to search the ocean in hopes of locating the lost flyers. But, fate decreed that he, too, should meet the same fate. It was fitting that he should die so heroically.

END.



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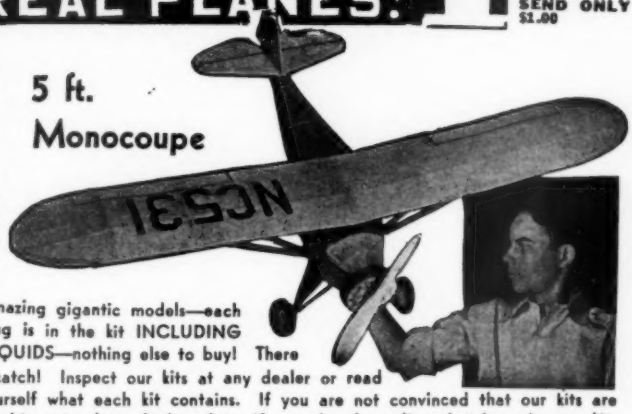

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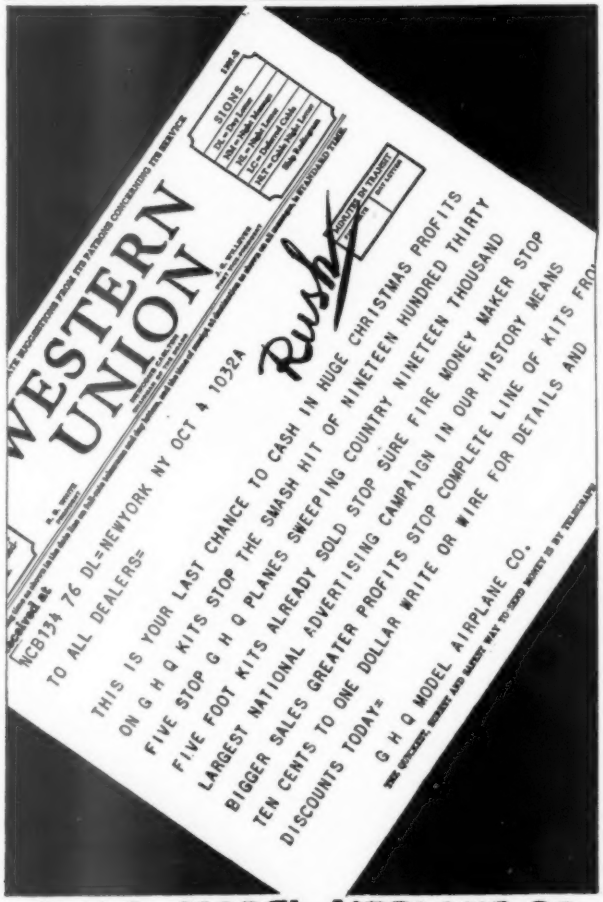
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- ☐ Douglas Mailplane
- ☐ Stinson "R"
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- ☐ Fokker D-7
- ☐ Fokker D-8
- ☐ Polish Fighter
- ☐ Monocoupe
- ☐ Falcon
- ☐ Aeromarine
- ☐ S. E. 5
- ☐ Sopwith Camel
- ☐ Aeronca
- ☐ Fairchild
- ☐ Army Hawk
- ☐ Curtiss Robin

36" FLYING KITS
- ☐ Douglas Y-10
- ☐ Curtiss A8 Attack
- ☐ Northrop Gamma "Skychief"

5 FT. FLYING KITS
- ☐ Monocoupe
- ☐ Stinson Reliant
- ☐ Heath Parasol

SEND MONEY ORDER, CHECKS, STAMPS OR CASH. Don't Fail to Include Postage for Each Kit With Your Order. One-Day Service.

Name .....
Street .....
City..... State.....

Airy Chat

(*Continued from page 348*)

FEW people realize the rapid increase of air resistance and the power required for overcoming the resistance when the speed of an airplane is increased. The following little example will show our readers why it is so difficult to reach a speed of 500 miles-per hour. A flat plate of one square foot area requires 2.66 horsepower to propel it through the air at 100 miles-per-hour. At a speed of 500 miles-per-hour, this same square foot of surface requires slightly more than 1,000 horsepower. The pressure on this square foot is 750 pounds at 500 miles-per-hour. These facts should be significant to those who wonder why airplane speed does not increase indefinitely.

* * *

PILOTS of single-seat fighters have held the limelight in the majority of World War stories. The heroes of the poor slow old two-seaters have been neglected although they bore the brunt of the attacks in most cases.

In this issue, Carl B. Ogilvie will tell you of a real hero who rode the skies in a two-seater, fighting as well as performing the regular duties of an observation pilot. An escort of fighters was not an essential in his life—he repeatedly defended himself successfully against any planes that the enemy sent against him.

* * *

AND we have another story in this issue that displays an entirely different but fully equivalent type of courage. This story, telling of a new meteorological principle, also tells of two men who actually went out hunting for hurricanes and tornadoes, found them and then coolly took snapshots and analyzed the disturbances! I believe that I had rather sit in the rear seat of an observation plane during a good healthy war any old time than to stand up in the open and look a roaring raving tornado in the face.

* * *

METEOROLOGY is now one of the most important subjects and the least understood, of all subjects in aviation. Airplane and engine design are fairly well understood, the instruments of navigation are practically perfected, adequate beacons and landing fields are at hand—but when it comes to weather prediction we are all at sea. Therefore, this latest development in aviation meteorology described in this issue should meet with the applause that it deserves.

* * *

Sorry that we were compelled to omit the World Airplane Directory this issue. Will complete it soon. J. B. R.

Model Engine

(*Continued from page 380*)

Exhaust Manifold
By-pass Cover
Crank Case and Cover
Connecting Rod
Cam Washer
Prop Washer
Streamlined nut
} Die cast metal —20 times stronger than aluminum.

Carburetor—Mixing valve (Positive control at all speeds).
Timer—New, simple design.
Spark Plugs—Special designed AC plugs —sharp points.
Tank—1¾ oz. capacity—light weight.
Coils—A new development for model engines. All wires clip on. Weight 2¼ oz.

Motors are mounted on wooden base and delivered as a complete unit.

END.

Rearwin

(*Concluded from page 375*)

has even more visibility than the Sportster. All operation controls have ball bearings. The Speedster may be had with either of two motors, the 95 H.P. inverted Cirrus, or the 125 H.P. Menasco.

SPECIFICATIONS.

Rearwin Speedster, Model 6000
Powered with 95 H.P. inline, inverted Cirrus Engine (As Illustrated)

Wing Span	32 ft.
Length Overall	21 ft. 6 in.
Height Overall	6 ft. 6 in.
Power Loading	16.9 lbs. per h.p.
Wing Loading	11.5 lbs. per sq. ft.
Empty Weight	1042 lbs.
Useful Load	598 lbs.
Pay Load	205 lbs.
Gross Weight	1640 lbs.
Fuel Capacity	34 gallons
Maximum Speed	144 miles per hr.
Cruising Speed	120 miles per hr.
Landing Speed	45 miles per hr.
Rate of Climb	750 ft per minute
Cruising Range	600 miles

END.

NEW BOEING P 26 A ARMY FIGHTER
WITH NEW TYPE FINISHED HOLLOW BALSA FUSELAGE
World's Easiest Model to Build

NEW NEW

22" Span. Length 18". Weight 2¾ oz. ¾" Scale.

For those who prefer to do the least amount of work in building a sensational and exclusive model we have produced this model with a completely finished strong hollow balsa fuselage made by special exclusive process with built-in headrest and wing stubs, also rubber motor already installed. An exact scale copy from factory plans of one of the fastest and best streamlined ARMY fighters ever produced. This is a flying scale model.

Set includes finished fuselage just as pictured below, also 3" 9-cylinder celluloid motor, a 3¼" special tapered spun aluminum cowl, celluloid wheels, 8" steel type carved propeller, aluminum motor plate, tail wheel, printed wing, rudder and tail ribs, pants, etc., insignia, yellow and blue dope, paint, glue, scale drawing, etc. This model is a good flyer and a masterpiece of beauty. Construction Set Complete, postpaid..... $4.50

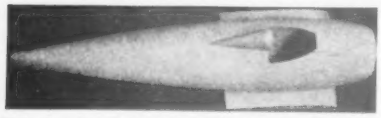


Photo of new type hollow balsa fuselage furnished in set as shown with built-in headrest, wing stubs and rubber motor already installed.

Advantages of hollow balsa fuselage
1. Fuselage will not warp or twist.
2. Takes glasslike finish.
3. Unsurpassed streamlining.
4. Model can be finished in a few hours.
5. Finished model a showpiece.
6. Exclusive—not obtainable elsewhere.

MINIATURE AIRCRAFT CORPORATION
83 Low Terrace New Brighton, New York

The FLYING FLEA
How To Build and Fly It!

COMPLETE instructions and detailed drawings for building this famous French lightplane. Authentic translation from the French of Henri Mignet, the designer. Price $3.00 postpaid.

Popular Aviation 608 S. Dearborn St. Chicago, Ill.

"Hello there, modelbuilders of the world—this is Old Santa himself speaking—

I hope you're getting ready for a rousing big Christmas. Best way I know of really having it is—with Cleveland-Designed models. Honestly, they're the most realistic flying models I've ever seen, and you know old Santa's been around everywhere. Fact is, they're so good that we've stopped making model airplanes at North Pole headquarters—and just send our business to Cleveland—those people are experts at it. Well, it won't be long now, and I hope my list includes some of these wonderful C-D's for you. Better get busy right away!"

All Dwarf ½" Kits Contain

practically everything you get in the ¾" Kits—except NO liquids, nor striping tape. Dwarfs are 2/3 the size of the ¾" models. If ordering Dwarfs direct, 10c extra for handling must be included, unless 6 or more are ordered. Below is given the list of Dwarfs of the models shown on this page. These Dwarfs are the "talk of the model world."

Range 25c to 85c
Two at $2.50

MODELBUILDERS— Christmas is your BIG day of the year—so make it a long remembered one by adding some of these 28 flying C-D Kits to your list. Show Mother, Dad, your Wife—or whoever is wondering what will please you most—the models you want. Tell them to ask your dealer for them, or if not convenient, to order direct from us. **And don't forget—the Cleveland line is the finest, most beautifully packaged and honestly priced, on the market.**

P. S.—If you're going to buy a special gift for yourself, or give something to a modelbuilding pal—any of these should make an extra big hit.

TWO LARGE BEAUTIES (space does not permit illustrating 'em), SF-35: Boeing 247, and SF-45: Martin Bomber, at $8.50 each. Rush 3c stamp for Illustrated List showing them and 20 others not listed here.

All SF ¾" Kits Contain

pilot and propeller blocks and coloring. Black for all details. Thread for bracewires. Finest grade balsa—clearly printed out. All necessary strip wood. Sufficient dope, cement and tissue cement. Material for both flying and scale propellers. Photos and full size copyrighted drawings. Authentic rib and stringer material. All necessary insignia, tape for color striping, special new shaped woodblocks, etc., etc.

Range 98c to $3.75
Two at $8.50

31 DWARF KITS for the models shown here:

(Kit numbers correspond to SF Kit numbers)

Kit	Price
D-1	65c
D-2	50c
D-8	65c
D-11	45c
D-14	45c
D-15	60c
D-17	50c
D-18	30c
D-19	65c
D-20	45c
D-21	75c
D-23	65c
D-24	85c
D-26	35c
D-27	50c
D-28	45c
D-29	65c
D-32	85c
D-33	30c
D-35	$2.50
D-36	25c
D-37	75c
D-40	60c
D-41	85c
D-42	25c
D-43	85c
D-45	$2.50
D-46	50c
D-47	50c
D-48	50c
D-49	85c

When 6 or more "Dwarfs" are ordered at one time, you save the "10c per Kit" handling charge.

The Great Lakes Sport Trainer
Span 20", length 15¾". Beautiful flights. Easy to build. Orange and cream. Kit SF-1, $2.65.

Famous Travel Air Mystery Ship
Span 21⅜", length 14⅞". Swift flyer. Rich in detail. Red, black scalloping, green trim. Kit SF-2, $2.95.

U. S. Army Boeing P12-E
Span 22½", length 15¾". Excellent army model. Yellow, olive drab with red trimmings. Kit SF-8, $2.85.

English A-W QUAD Fighter
Span 20⅝", length 18⅞". Unusual fine-flying type. Easily built. Red, white and blue. Kit SF-11, $2.50.

Von Richthofen's Fokker Triplane
Span 17⅝", length 14½". Famous war model. Authentic coloring. Red, silver and white. Kit SF-14, $2.50.

Beautiful Fokker D-7 Fighter
Span 21½", length 17". Rich in details. Orange, green, white, black details. Kit SF-15, $2.95.

'31 Air Race Winner—Bayle's Gee-Bee
Span 17⅛", length 12". Speedy flights. Beautiful lines. Yellow and black. Kit SF-17, $1.95.

The Swift Howard Racer "Pete"
Span 15", length 13⅛". Excellent flights. Easy to build. All white, black details. Kit SF-18, $1.35.

Schneider Winner—Supermarine S6-B
Span 22¼", length 21⅝" overall. Many unusual features. Will R.O.W. Silver and blue. Kit SF-19, $2.50.

Hawker Highspeed Fury Fighter
Span 22¼", length 19½". Redesigned. Long fast flights. All silver. Kit SF-20, $2.65.

U. S. Army Hawk P6E Fighter
Span 23⅝", length 16⅝". Most authentic Hawk on the market. Yellow, olive drab. Selfridge Field markings. Kit SF-21, $3.25.

U.S. Army Boeing P-26
Span 20⅜", length 17⅜". Very popular. Super-detailed. Yellow and olive drab. Kit SF-23, $2.50.

The World-Renowned Lockheed Vega
Span 30⅜", length 20⅝". Beautiful in looks—and flights. Brilliant red and cream. Kit SF-24, $3.25.

Long Flying Heath Parasol Sport
Span 23⅛", length 12⅝". Excellent for beginners. Steady flyer. Orange and black. Kit SF-26, 98c.

'32 Air Race Winner—Gee-Bee Supersportster
Span 18⅝", length 13⅜". Fast flights. A beauty in looks. White, red scalloping. Kit SF-27, $2.50.

Popular Monocoupe Sportplane
Span 24", length 15¼". Has won many first prizes in contests. Cream and orange. Kit SF-28, $2.50.

U.S. Navy Boeing F4B3 (or 4)
Span 22½", length 15⅝". Exciting to build—thrilling to fly. Silver, yellow and red. Kit SF-29, $2.85.

Big Boeing 95 Mailplane
Span 33¼", length 24⅜". Easy for beginners. Good duration flights. Blue and silver. Kit SF-32, $2.50.

Comper Swift Lightplane
Span 18", length 13⅜". Redesigned. Excellent flights. Green with black fuselage design. Kit SF-33, $1.25.

Sensational Lincoln Sport
Span 15", length 12⅛". Beginner's model. Interesting flights. Cream, black trim. Kit SF-36, 98c.

Popular Waco C Cabinplane
Span 24¾", length 19¼". Beautiful model. Good flyer. Silver and red. Kit SF-37, $3.25.

Aeronca C-3 Sportplane
Span 27", length 15¼". Keen flights and very easy for beginners. Red and silver. Kit SF-40, $2.65.

2-place Vought Corsair V-65
Span 26⅞", length 19⅜". Super detailed. Beautiful flights. Blue, yellow, red, black, and silver. Kit SF-41, $3.75.

4-Wheeled Howard Racer "Ike"
Span 15⅝", length 12⅞". Flies and climbs beautifully. Also data for "Mike." White, black details. Kit SF-42, 98c.

Douglas O-38 Observation
Span 30½", length 22¾". Very beautiful, and unusually well detailed. Yellow, olive drab, black details. Kit SF-43, $3.75.

'30 Air Race Winner—Laird Solution
Span 15⅞", length 13⅝". A fast flyer. Pretty lines. Gold and black. Kit SF-46, $2.50.

'33 Air Race Winner—Wedell's W-Williams
Span 19½", length 16¾". Very beautiful in appearance and flights. Red, black and bronze. Kit SF-47, $2.95.

'34 Air Race Winner Turner's W-Williams
Span 19½", length 16⅜". Roscoe Turner's plane. Fast flying. Wedell-Williams gold. Kit SF-48, $2.95.

Read Before Ordering

If your dealer hasn't or won't get the C-D's you want, order direct, mentioning his name, sending check, or money order—cash at your own risk. No C.O.D.'s. On "Dwarfs"—add 10c extra per Kit for handling. Canada, Mexico, British Isles customers, add 10% to all prices—all other countries, 20%.

DEALERS

Check your C-D stock, and order the Kits you need immediately. Avoid last-minute delays—write TODAY.

CLEVELAND MODEL & SUPPLY CO., INC.

Highest Quality 1866PAM WEST 57th ST., CLEVELAND, OHIO, U. S. A. *Lightning Service*

Speed Westphal

(*Continued from page 378*)

co-operation of all clubs and other active individuals. If we devote space to the subject, we must have interesting material to publish, therefore I ask all of you to keep me informed of all activities in your locality.

As soon as is possible, I will attempt to give you complete information on all proven and suitable soaring sites in this country. At present, I know of three or four which I will describe as clearly as possible. The largest and best equipped soaring site in this country is, of course, "Harris Hill" which is located six miles west by north of Elmira, N. Y., in Chemung County.

This mountain is about 1,600 feet above sea level and drops off at about 45° to a large flat valley some 800 feet below the take-off point. It is very flat on the top and suitable for any type of launching, including automobile tow. There are four other soaring ridges within a few miles of Harris Hill so that one may soar in almost any wind.

The roads leading to the top of these ridges are in fine shape and may be used any time of the year. Additional information concerning these New York fields may be secured by writing directly to Mr. Youston Sekella, president of the Elmira Gliding Club, Inc., Elmira, N. Y.

In the State of Michigan there are several good soaring sites. One at St. Joseph, and the others which have only recently been developed at Sleeping Bear in the northern part of the state. The site at St. Joseph is a sand bluff which lies on the eastern shores of Lake Michigan and is only several hundred feet high. While it is not suggested that you try to break any records here, the cool air blowing in off of the lake furnishes sufficient lift to give you practical soaring experience. The second soaring site, along with several other potential locations are along the point of land between Lake Michigan and Grand Traverse Bay, near the upper east shore of Lake Michigan.

For soaring in the State of Wisconsin, I would suggest "Eagle Point" which is located on the eastern shore of the Mississippi River just a half mile from the town of Bagley. The hill is only 500 feet above the valley and rather steep, also, because of space, shock-cord launching would be necessary. There is plenty of fine landing space at the foot of the hill and the ridge itself is several miles long. After looking this site over, both from the ground and by airplane, I believe it suitable for both ridge and thermil soaring.

In the State of Washington, there is a beautiful site located near the City of Pullman. This ridge is known as "Tiptoe Butte" and will be found on the maps as being near the winding "Snake River." Mr. Cloyd Artman and other members of his club have successfully soared a primary glider over this ridge so I believe a good sailplane should do all right.

Illinois has several good soaring ridges which are found near the famous ski slide where national ski meets are held each winter. These ridges are located on the shores of the Fox River, near the City of Cary which is only an hour drive from the heart of Chicago. On one of these ridges, I successfully soared a primary glider back in 1929. There are also some very fine locations to be found in the southern part of the state near look-out mountain.

In the State of New Jersey, there are many fine soaring sites. The two most prominent are at Warwick and Millington.

END.

BUILD A GLIDER AT HOME!

For the first time, a completely detailed set of blue-prints is now available for the construction of the "WINDRIDER-CONVERTIBLE" glider.

This glider may be easily converted into a secondary two-place or a powered job. Now is the time to build this wonderful ship while the price of material is low.

AN OUTSTANDING BLUE-PRINT OFFER

Send $4.00 ($5.00 in foreign countries) by P. O. Money Order, made payable to SPEED WESTPHAL, 5512 Drexel Blvd., Chicago, Ill. Prints will be shipped on the same day that order is received.

Answers to Cartoon

by ROBERT JOHNSON

(*Continued from page 374*)

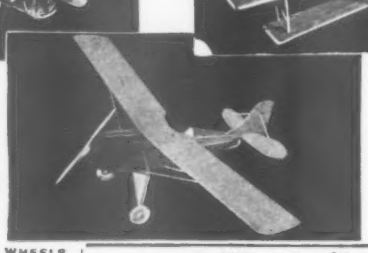
DURALUMIN is an aircraft alloy that consists of aluminum combined with other elements, some of which are lighter than aluminum. This makes the alloy as light or slightly lighter than aluminum and by a process of heat treatment (hardening and tempering) the Duralumin is as strong as mild steel. It is not possible to heat-treat pure aluminum which is always soft and weak in its pure state.

(2) Dry ice is solid frozen carbon dioxide gas. Its temperature is 110 degrees below zero. Through some freak of nature, a tremendous pressure was created by the Salton Sea upon the carbon dioxide gas underground, first liquefying and then solidifying the gas. It is only circumstance that this should occur in one of the hottest parts of the United States for the air temperature and ice temperature are independent of one another at low levels.

(3) Since the sun is much larger than the earth, light rays reaching the earth are practically parallel, hence the shadow of the plane is very nearly equal in size at any ordinary altitude, possibly within a millionth of an inch.

END.

36" FLYING KITS...*and, boy, do they FLY!*



(Shown above) **CURTISS GOSHAWK** *Complete, Postpaid* **1.35**

(Upper right corner) **FOKKER D-VII** *Complete, Postpaid* **1.00**

(Shown at right) **CORBEN SUPER-ACE** *Complete, Postpaid* **1.00**

Free offer not included with these kits.

Complete—nothing else to buy. Best quality materials and plenty of them. Plenty of dope, cement, AA Jap tissue. Grade A balsa, printed rib sheets, printed formers, wire parts formed, finished propeller, real scale full-size 36" wingspan plans.

18 IN. LENGTHS
1/16x1/16 ...100 for 5c
1/16x1/8 .... 35 for 5c
1/8x1/8 ..... 30 for 5c
1/8x1/4 ..... 10 for 5c
1/4x1/4 ..... 5 for 5c
1/2x1/2 ..... 2 for 5c

18 IN. SHEETS
1/32 or 1/16x2.8 for 10c
1/8x2 .....6 for 10c
1/4x2 .....3 for 9c

18 IN. PLANKS
1x1 1 for 4c|2x2 1 for 18c
1x2 1 for 10c|2x3 1 for 23c

JAP TISSUE
1 doz. all col., AA..19c

SILVER TISSUE
20"x24" .....each 5c

SUPER-FINE TISSUE
White Only
Sheet, 5c; dozen, 50c

DOWELS
1/16x6 .....doz. 5c
1/8x18 ..... 2 for 5c

BALSA WHEELS
1/2" .. 3c 3/4" .. 4c
1" .. 5c 1 1/2" .. 7c
2" ..10c 2" ..17c

BIRCH WHEELS
1/2" .. 2c 3/4" .. 3c
1" .. 4c 1 1/2" .. 5c
2" 10c

WIRE
2 ft. 1c 25 ft. 10c

INSIGNIA SHEETS
24 insignia and stripes 5c

WASHERS
1 doz. 1/8 or 1/4 ... 1c

PROPELLER BLOCKS
1/2x 3/4x 6...6 for 5c
5/8x1 x 7...3 for 5c
3/4x1 x 8...3 for 5c
3/4x1 1/4x10...2 for 5c
3/4x1 1/4x12...1 for 4c
1 x1 1/2x12...1 for 7c
1 x1 1/2x15...1 for 9c

SHEET ALUMINUM
.005 in., 6x6.....5c
.010 in., 6x6.....6c

CLEAR DOPE
1 oz...5c 1/2 pt...30c

COLORED DOPE
1 oz. bot., all col., 5c

CLEAR CEMENT
1 oz. bot. 5c; 2 oz. 10c
1/2 pt. bot.....35c

FREE With every order of $1.00 or over postpaid—2 oz. bottle CLEAR CEMENT and 100 1/16x1/16x18 BALSA STRIPS

MACHINE-CUT PROPS
5"... 5c 6"... 6c
7"... 7c 8"... 8c
10"...10c 12"...12c

BAMBOO
1/16x1/16x12
36 for 5c
1/16x1/4x15 ..ea., 1c
doz. 10c

THRUST BEARINGS
Small, doz. 10c
Large, doz. 15c

RUBBER
1/16x1/16 ..18 ft. 5c
1/8 flat .....15 ft. 5c

WOOD VEN. PAPER
20x20 ..... 1 for 10c

SHEET CELLULOID
6x8..5c 12 1/4x16..20c

MODEL PINS, pkg. 5c

THINNERS, 1 oz. 5c

Postage paid on all orders in United States for 75c or over, except west of Miss. add 10%; Canada and Foreign, add 15%. Under 75c, add 15c. Send 3c stamp for illustrated catalog (free with orders). NO STAMPS. NO C. O. D's.

REED, 2 ft.....1c
BUSHINGS, 1 doz. 3c
SANDPAPER, pkg. 5c
PROP SHAFTS, doz. 8c
NOSE PLUGS, doz. 10c

Dealers, Clubs, Schools: Send for Wholesale List

DUMMY RADIAL ENGINE
1 1/2" d. 18; 2" d. 23; 3" d. 33

ENGINE AND COWL ATTACHED
1 1/2" dia. 20; 3" dia. 35

CELLULOID WHEELS
3/4" pr. 5c 1 3/4" pr. 10c
1" pr. 7c 1 7/8" pr. 17c
3" pr. 30c

CELLULOID PANTS
1/2" to 1" .....pair 18
1 3/8" to 1 7/8"....pair 33

ALUM. COWLINGS
1 1/2" 15c; 2" 18; 3" 25
Specify whether anti-drag, closed, or open.

BOMBS
3/4" 04; 1 1/4" 07; 3" 12

GUNS WITH RING MOUNT
1 1/4"....10; 1 3/4"....18

PURSUIT MACHINE GUNS
3/4", 1 1/4" or 1 3/4", ea. 05

PROPELLERS

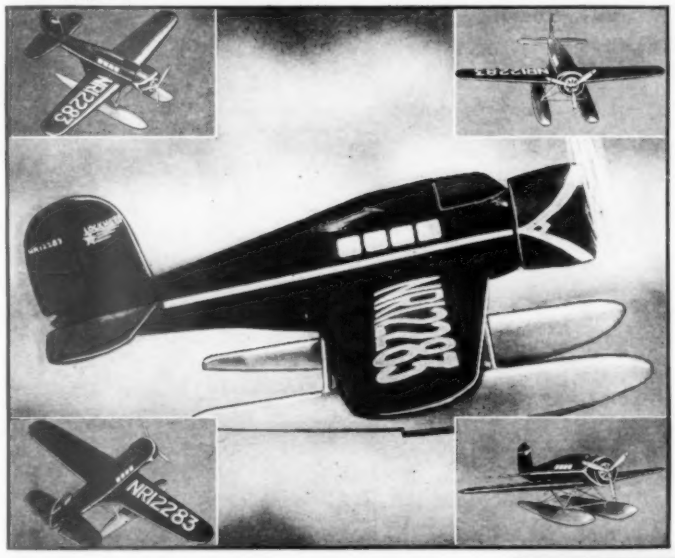
	2 blades	3 blades
1 1/4"	08	10
2 1/2"	12	15
3 1/2"	18	20
4 1/2"	20	25

WING AND TAIL LIGHTS
12" 10c; 15" 15c; 24" 20c

20 IN. FLYING PLANS 10c—3 for 25c
Sparrow Hawk, Boeing Trans. 247, Spad Chass., Vought Corsair, Curtiss Swift L. W., Waco Cabin Biplane, Douglas Dolphin, Boeing P12F, Fokker D-VII, S.E.5, Goshawk, Gee Bee.

IMPERIAL MODEL AERO SUPPLY
Kensington Sta.,
416 McDonald Ave., Dept. A, Brooklyn, N. Y.

Build The Famous HEATHE WILL ROGERS & WILEY POST LOCKHEED... *A New 36 in. Record Breaking Flyer*



A 36" FLYING SCALE MODEL

HERE'S the plane that is sure to touch the heart of every model builder . . . . it's an exact replica of the famous Lockheed flown by the two great immortals "Will Rogers" and "Wiley Post" . . . . too bad neither of these great men can be here to see how exactly we have matched and duplicated every detail of the great original. You will want to build this new 36" record breaking flyer and keep it as a memento.

Contains HEATHE'S new copyrighted, simplified plans and instruction sheets. All parts printed on balsa. Optional supplies for movable controls from the cockpit, carved prop, cowling, loads of wood, cement, dope, colored tissue, rubber, bent wire parts, sandpaper and razor blade, etc.

Can be flown as a land plane.

$1.50 Postage FREE

SPECIAL See our bargain supplies below. FREE 6 1/16 x 2 x 18 plus 100 1/16 square Balsa with each $1.00 order. FREE with each $2.00 order 250 ft. of finest para rubber 1/8" flat.

FREE PHOTO of Will Rogers and Wiley Post Taking Off

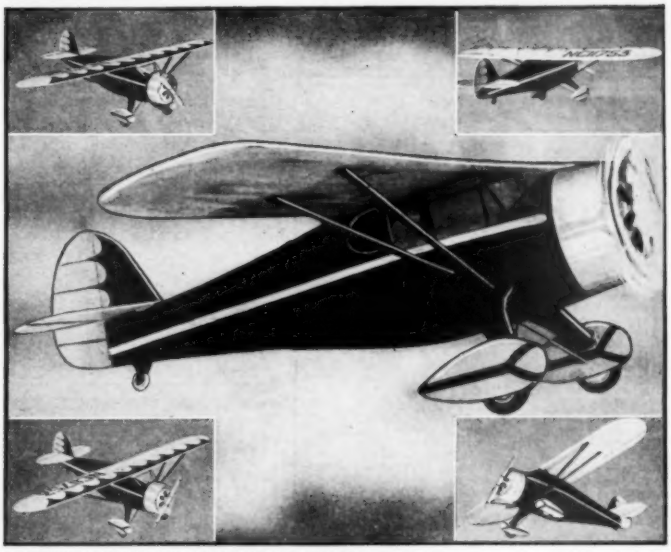
We were fortunate in securing a limited number of photo copies of Wiley Post and Will Rogers taking off in the ill-fated Lockheed at Fairbanks, Alaska. These pictures are beauties, size 5x7 (suitable for framing). **FREE to every purchaser of $1.00's worth of kits or more. FREE.**

A New 36 Inch Monocoupe

With Movable Controls

HERE'S the sensation of the model airplane industry . . . . . of course it's a HEATHE scoop. Trial tests have exceeded our own expectations. This new 36" Monocoupe has broken all records. In fact, when she was up in the air she looked like a real big airplane instead of just a model. Our engineers were painstaking in planning and designing this model for you. They visited the Floyd Bennett field, saw the real **MONOCOUPE** and discussed its various parts with aviation engineers . . . . then they completed the model offered to you here. You will agree it is a beauty. Contains the identical HEATHE new simplified copyrighted plans and all the other supplies and accessories included with the Lockheed described above. Order yours today and be the first to fly this new HEATHE master of the air.

$1.00 Postage FREE



SPECIAL Combination Xmas Offer

Gift time is here! HEATHE wants to give everyone a chance to save money. Here's our special combination offer which many of our friends and customers will want to take advantage of for Xmas. Here's what we give you for only $3.00 postpaid:

1—Wiley Post Kit	@	$1.50	ALL FOR
1—Monocoupe Kit	@	1.00	
1—"2 in 1" Fokker D-7 and Curtiss Robin Kit	@	.59	$3.00
3—Solid Replicas	@	.25	
		$3.34	Postpaid

This gives you an additional saving of 10% off our already low prices . . . and don't forget you get a **FREE** Wiley Post-Will Rogers picture described above . . . **ORDER TODAY!**

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1/16x1/16	50 for .05
1/16x1/8	25 for .05
1/16x3/16	20 for .05
3/32x3/32	21 for .05
1/8x1/8	20 for .05
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SEE OUR BIG COMBINATION OFFER

Solid Replicas Your choice of Boeing P-12F, Texaco Sky Chief, Spad, Fokker D-VII, Lockheed Vega or S.E.5, furnished with full-size plans and separate instruction sheets and all accessories. **3 for 25c**

3/16x3/16	10 for .05
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1/64 x 2	5 for .10
1/32 x 2	7 for .10
1/16 x 2	7 for .10
3/32 x 2	6 for .10
1/8 x 2	5 for .10
3/16 x 2	4 for .12
1/4 x 2	3 for .11
1/2 x 2	2 for .12

(For 3"x18" double width cont.)

18" BALSA PLANKS

1" x1"	1 for .07
1" x1½"	1 for .09
1" x2"	1 for .11
1" x3"	1 for .15
2" x2"	1 for .20
2" x3"	1 for .25

BALSA PROPELLER BLOCKS

½x ⅝x 5	7 for .05
½x ⅝x 6	7 for .05
⅝x1 x 7	3 for .05
⅝x1 x 8	2 for .05
⅝x1¼x10	1 for .04
⅝x1¼x12	1 for .05
1 x1½x12	1 for .07
1 x1½x15	1 for .08

RUBBER

1/32 sq.	30 ft. for .05
.045 sq.	20 ft. for .05
3/32 flat	20 ft. for .05
1/8 flat	17 ft. for .05
3/16 flat	12 ft. for .05

COLORLESS CEMENT

1 oz.	.05
2 oz.	.08
4 oz.	.15
1 pt.	.50

CLEAR DOPE OR BANANA OIL

1 oz.	.05
2 oz.	.07
4 oz.	.13
1 pt.	.45

Thinner same price as clear dope

COLORED DOPE

White, yellow, orange, blue, red, green, olive drab, black, silver gold.

1 oz.	.06
2 oz.	.10
4 oz.	.19
1 pt.	.65

JAPANESE TISSUE

White, per doz. .18
Colored, asst., per doz., all colors .20

SILVER TISSUE

20"x24" . . . each .05

TURNED BALSA WHEELS

Prices per pr.

½"	.03	¾"	.04
1"	.05	1¾"	.07
1¾"	.12	2"	.20

CELLULOID WHEELS

Prices per pr.

¾"	.05	1"	.07
1¼"	.10	1⅞"	.16

SUPER-FINE TISSUE

White Only
Sheet, 5c; dozen, 50c

BAMBOO

1/16 sq. x 14	35 for .05
1/16 x 1/4 x 11	1 for .01
1/16 x 1/4 x 11	1 doz. for .07

REED

1/32 or 1/16	6 ft. for .02
3/32 or 1/8	5 ft. for .02

WASHERS

(⅛ or ¼ dia.)
1 doz. .01 1 gross .10

WIRE

Straight Lengths
Nos. 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, or 16.
6 ft. for 03

SANDPAPER

5 large sheets . . .05

DOWELS

1/16"x12"	doz.	.06	
⅛"x18"	6 for	.05	
3/16"x18"	4 for	.05	
¼"x18"	3 for	.05	

SHEET ALUMINUM

Prices per sq. ft.
.002 thick 08
.005 thick 10
.010 thick 17

THRUST BEARINGS

Small or large, 2c each, or 15c per doz.

DUMMY RADIAL ENGINES

Celluloid, 9 Cylinders.

1½" diam.	.18
2" diam.	.23
3" diam.	.34

ALUMINUM TUBING

Per Ft.

1/16	.09	3/32	.07
1/8	.07	1/4	.10

TURNED HARD WOOD WHEELS

Per Pr.

½" diam.	.02
⅝" diam.	.03
1" diam.	.03
1⅛" diam.	.05
1¾" diam.	.07
2½" diam.	.10

INSIGNIA SHEET

12 pr. and rudder and tail markings with gummed back. Each 05

MODEL PINS

Package of 100. .05

ALUMINUM LEAF

(.0003 of an inch in thickness, 3½ wide) 5 feet for 05

CELLULOID PANTS

½" to 1" Pair .18
1⅛" to 1⅞" Pair .33

15-Inch Flyers

2 in 1 Kit, Fokker D-VII Curtiss Robin. Astounding value! Contains complete supplies and latest, new improved short cut ARC plans, all accessories, etc. Both: Fokker D-VII and Curtiss Robin. **Postage Free.** **2 FOR 59c**

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No orders under 50c. Add 15c for packing and postage to orders under $1.50. Orders over $1.50 add 10% of order. When ordering 36" lengths add extra 10c. Canada 10c extra. No. C.O.D.'s. Your gift is sent with your order.

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SOLID SCALE MODELS

Actual Photograph of the D.E.L. Model SIKORSKY "CLIPPER" S-42 Span 17¾"

Kit contains semi-cut balsa hull, bored bass port hole stripe, semi-shape balsa wing, outline tail surfaces, floats, cabane, poplar turned nacelles, bass struts, metal cast propellers, motor plates, lacquered motors and numerals sheet, reed, celluloid, sandpaper, etc. 1 oz. silver dope, 1 oz. silver undercoat, 3 dr. black dope, ⅛ oz. glue, pkg. of wood filler, full size 3-view drawings with complete instructions.

Postpaid $1.75

Span 17¾"	Martin Bomber	$2.00
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Span 12½"	Los Angeles Dirigible with metal cast base and turned hull	1.25

Each Kit contains everything required to make a complete Model. Kits are sent prepaid and insured. Send 3c stamp for illustrated folder. Ask your Dealer: if not obtainable, order direct. West of Denver, Colo., 25c extra. Canadian Prices 40% higher to cover duty. Remit cash by Money Order. No stamps. No C.O.D.'s.

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FREE! *Your choice of—*
1 DOZ. SHEETS JAP. TISSUE
or MODEL BUILDER'S KNIFE
with orders of $1.00 or more

18" BALSA SHEETS		18" BALSA LENGTHS	
1/32x2, 8 for 6c	10 for 10c	1/16x1/16	85 for 5c
1/16x2, 5 for 6c	10 for 12c	1/16x⅛	40 for 5c
3/32x2, 3 for 5c	7 for 10c	1/16x3/16	20 for 5c
⅛x2, 1 for 2c	6 for 8c	1/16x¼	18 for 5c
3/16x2, 1 for 3c	3 for 7c	3/32x3/32	35 for 5c
¼x2, 1 for 4c	3 for 9c	⅛x⅛	30 for 5c
½x2, 1 for 5c	3 for 14c	¼x¼	6 for 5c
BALSA PROP BLOCKS		¼x½	4 for 5c
¼x¾x6, 1 for 1c	6 for 5c	½x½	2 for 5c
½x¾x5, 1 for 1c	5 for 5c	18" BALSA PLANKS	
⅝x1x8, 1 for 2c	3 for 5c	1x1, 2 for	9c
¾x1x8	2 for 5c	1x2, 1 for	9c
¾x1¼x12, 1 for 3c	2 for 6c	2x2, 1 for	16c
1x1½x12	2 for 11c	2x3, 1 for	21c
1x1½x18	1 for 7c	2x6, 1 for	35c

For 36" lengths double above prices and add 10c postage. Dealers: Send for prices on Balsa Wheels with Brass Bearings.

WASHERS. ⅛ and ½ doz. 1c	PAUL-O-WINA Jap Props	Rubber Motors
SANDPAPER, package 5c	5" 10c	1/16 sq. 20 ft. 5c
WIRE, 6 ft. 3c	(Add 5c per in. for props up to 10".)	⅛ flat 20 ft. 5c
36" lengths.	Bamboo	INSIGNIAS— French, American, English, German
ALUM. LEAF, 2 sheets for 1c	1/16x12 40 for 5c	1¼" 4 for 3c
DOWELS, 1/6x12, 10c per doz.	1/16x¼x15 6 for 5c	2" 1c
PROP. SHAFTS, 2 for 1c	Shredded 40 for 5c	INSIGNIAS, 1 sheet of 24 5c
NOSE PLUGS, Large 10c doz. Small 5c doz.	Japanese Tissue all colors; doz. 16c	Wooden Wheels
THRUST BEARINGS 1c	Sheet Celluloid	½" pair 3c
BRUSHES, No. 6 5c	2x6 2c	⅝" pair 3c
MODEL PINS, lge. & sml. pkg. 5c	6x8 8c	¾" pair 4c
BUSHINGS, 1 doz. 3c	12x16 15c	1" pair 7c
PLANS	Clear Dope	1⅜" pair 9c
20" Plans, each 10c, 3 for 25c	1 oz. 5c	1⅞" pair 15c
Waco Biplane, Texaco Sky Chief, Spad Chasseur, Sparrow Hawk, Vought Corsair, Douglas Dolphin Amphibian, Twin Skyflier, Sky Cloudster, Curtiss Goshawk, Swift Curtiss.	½ pt. 25c	Balsa Balloon Wheels
	Colored Dope	½" pr. 2c
	1 oz. 5c	⅝" pr. 3c
	½ pt. 30c	1" pr. 5c
	Thinner Best	1⅜" pr. 6c
	1 oz. 5c	2" pr. 8c
	Clear Cement	3" pr. 15c
	1 oz. 5c	Machine Props
	½ pt. 30c	5", 2c (add 1c per in. for props up to 16")
	Weed Veneer Paper	Dummy Radial Engines
	20x30", 1 for 9c, 2 for 17c	1½" Diam. 15c
	Reed	1⅞" Diam. 20c
	1/32, 1/16, ⅛ 3 ft. 1c	3" Diam. 25c

Send 3c stamp for "Helpful Hints for Model Builders" and catalog for other bargains. FREE with all orders. ORDERS 75c or under 15c postage. Postage prepaid on orders over 75c. West of Mississippi add 10c extra. Canada add 15% extra. CASH OR MONEY ORDER—NO STAMPS. NO C. O. D's.

SKYWAY MODEL AIRCRAFT SUPPLY CO.
383—7th Ave. (Dept. P) Bklyn., N.Y.

Hurricanes

(Continued from page 352)

hind the whirl. Here we encountered a full grown tornado head on, and got out of its path just in time. There was a loaded shot in the camera so we clicked it as the tornado went by. These pictures and the one of the broken cumulus clouds as the cold air came pouring in, are shown here. The cold-front was about forty miles deep.

In the evening, we reached the clear air on the west, and the storm detector gave silence to the west, indicating that we were in the clear air following the hurricane. We stayed all night in a CCC army camp as the guests of the commandment and next day we went on through wonderfully clear air to Pensacola.

The third hurricane was an insignificant affair. It was not predicted to be more than a Grade "C" storm. We got bearings for two days from Pensacola, showing that it was first off the Texas coast, then off the Louisiana coast and finally off our own coast, so we went down and stood on the Navy dock and watched the storm shield as it drifted slowly by.

It was so far out over the Gulf that we could not get to it, but we did take a shot of the clouds in its wake as pictured here. The next day it ran ashore in central Florida where it caused rather hevay rains.

Coming back to Chicago, by way of Arkansas and Missouri, we ran through the clear weather predicted for that quarter and, aside from being very dusty, on top of our being most thoroughly watersoaked from the second storm, we got in without incident.

The success of my new method of storm prediction and navigation and detection has aroused much official interest, and further tests are now being conducted along this line.

The importance of this work to aviation, and particularly commercial aviation, cannot be too strongly emphasized. Failure to predict storms accurately by present methods has accounted for approximately 40 percent. of all airline fatalities.

Beside the havoc wrought by storms, accidents due to engine trouble and structural failures are trivial—in number and magnitude—Radio and airway beacons have paved the way for this latest development.

END.

Grades of Hurricanes

IN this article, the author speaks of hurricane grades, which are based upon the degree of their destructiveness and violence. The following table will give you an idea as to the meaning of this grading and what it represents.

GRADE (AA). An unusually destructive hurricane such as the storm that visited Galveston, Texas, years ago. Destruction both by wind and water.

GRADE (A). A destructive hurricane in which damage is caused by both wind and water. The recent Florida hurricane was partly Grade (A) and partly Grade (B).

GRADE (B). Destruction by water alone and no damage by wind. A heavy downpour with mild wind.

GRADE (C). A storm with very heavy rain but not necessarily destructive.

GRADE (D). Very mild wind and rain.

It is interesting to note that the recent Florida hurricane consisted only of a narrow strip of Grade (A) and was mostly Grade (B). The persons killed were drowned and not injured by the wind. So heavy is the downpour with Grade (B) that a person will drown in the sheets of water should he trip and fall on ground level.

We Predict for 1936-

That there will be a big shake-up in the Bureau of Air Commerce that will benefit all aviation . . . that scheduled transpacific flights will be a reality . . . that the problem of storms and weather will be solved . . . that the two-cycle engine will gain ground and that airline disasters will be materially reduced in number.

We Start 1936 with a Big January Issue

THESE predictions are based upon developments made in 1935. The best way to determine whether the above predictions, and many made previously in the "Airy Chat," will come true will be to take out a POPULAR AVIATION subscription. Somewhere in the twelve issues, we believe, will be found verification for our convictions.

12 BIG ISSUES ONLY $2.50
POPULAR AVIATION
An Ideal Christmas Gift.

NEW CURTISS F11C4 NAVY PURSUIT

28" Span, Length 20½", Weight 4 oz., 1" Scale

THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD

A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3¾" celluloid, 700 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4" aluminum cowl ring, 9" carved spruce semi-scale flying propeller, colored star and rudder insignia, 2" celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, etc. All other parts printed on balsa. Detail scale drawing.
Construction Set Complete, postpaid **$4.50**

NEW LOCKHEED ARMY SPEED VEGA

DE LUXE SET. ALL PARTS READY CUT OUT

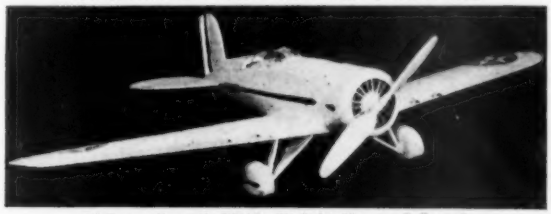
50" Span. Length 35". Color silver. 1¼" Scale

A new sensational flying scale model. Rises from ground in 15 feet and makes long steady flights. Const. set contains all formers and wing ribs cut out and notched for stringers, spars, etc., wheel pants ready cut, 3" turned balsa wheels, 5¾" turned balsa cowl front, 15" carved varnished steel type propeller shown, 5 oz. silver paint, glue, etc. Even an amateur can make a perfect model of this with ease.
Construction Set, postpaid **$8.50**

MONEY ORDERS—Issue to Staten Island, N. Y.

NEW LOCKHEED P23A NAVY FIGHTER

COMBINATION LAND AND SEA PLANE SET



32" Span. Length 22½". Weight 3½ oz. ¾" Scale

New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc. printed on balsa, a 3¾" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ½ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 foot rubber, large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world.
Construction Set in labeled gift box, postpaid **$2.95**

NEW BOEING F4B4 NAVY FIGHTER

22½" Span, Length 14½", Weight 2½ oz., Color, Silver and Yellow

New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished propeller, printed out balsa wood parts, silver dope, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia, and ¾" scale drawing. **Construction Set Complete, postpaid.** **$2.95**

NEW NORTHROP D2 ARMY PURSUIT

36" Span. Weight 4 oz. ¾" Scale

A de luxe set including 3" 9-cylinder celluloid motor, special 3¼" streamline tapered aluminum cowl, 9" steel type carved prop, all parts printed on balsa, silver paint, glue, tissue, aluminum, motor front, wheels, insignia, wire parts, tissue, and scale drawing.
Const. Set complete, postpaid **$3.95**

Curtiss Army Hawk P6E

24" Span. Weight 2½ oz. Colors drab and yellow

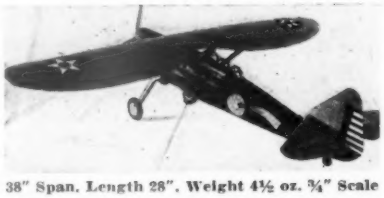
Set contains all parts printed on balsa, colored dopes, insignia, scale drawing.
Const. Set complete, postpaid **$2.50**

Northrop FTI Navy Fighter

22" Span, Weight 2 oz., Color Silver, ¾" Scale

Exact scale model of the Navy's latest 272 m.p.h. fighter. Set includes all parts printed on balsa, 3" turned cowl front, colored insignia, lettering, colored dope, drawing, etc.
Construction Set, postpaid **$2.00**

Douglas O45 Army Fighter

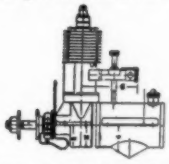


38" Span. Length 28", Weight 4½ oz. ¾" Scale

A beautiful large ¾" scale model of one of the latest army planes, capable of long flights. Set contains all parts printed on balsa, 2¼" turned wheels, windshields, colored insignia, U. S. Army lettering, 2 oz. yellow paint, 1 oz. blue, 1 oz. clear, 2 oz. glue, etc., 24 nickel plated hollow exhaust pipes, a 10" carved scale 2 bladed prop, and full sized scale drawing, 33x44. Model has a removable motor box, and can win almost any flight contest.
Construction Set complete, postpaid **$3.50**

1/5 H. P. Gasoline Model Motor

Weight As Shown 8 oz.

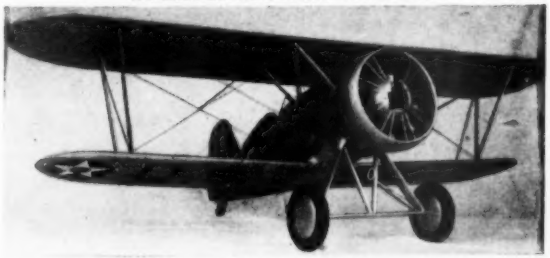


Long life motor has steel cylinder and piston, ⅞" bore x 1" stroke. Comes complete with gas tank, coil, condenser, batteries. Price ready to run, complete, postpaid. Only **$22.50**

15" or 19" laminated prop, for motor **$2.75**

BOEING F4B4 NAVY PURSUIT

1/5 H.P. Gasoline Motor Driven Model



68" Span. Length 44". 2¼" Scale. Color Silver

This is not just an ordinary large model, but one specially designed and engineered to stand the strain of the gas motor. The most realistic and life-like model of this size ever produced. As all the fuselage formers, wing ribs, tips, etc., are all cut out and notched for stringers, spars, etc., even a novice can make a perfect model of it with ease. Set contains 6" turned balsa wheels with bearings, rubber tail wheel, a special turned balsa 10" speed, cowl ring used on the latest Boeings, silk covering material, silver and red dope, glue, full size scale drawing, axles; all wood cut to size, etc. Weight of model with motor 3½ lbs.
Construction Set Complete, without motor, postpaid **$25.00**

NEW 1936 CATALOG. SEND 3c STAMP

A beautifully illustrated catalog, 8" x 10", ready November 15, 1935

California Dealer: JAYS MODEL AIRCRAFT, 7763 Melrose Ave., Hollywood, California

MINIATURE AIRCRAFT CORP., 83 Low Terrace, New Brighton, New York

Sopwith Planes

(*Continued from page 372*)

out the triplane was to improve the visibility and reduce the blind-angles that existed in both monoplanes and biplanes. With his head on a level with the center wing, the pilot could see through a practically unobstructed angle of 120 degrees. Cutting sections out of the center plane enabled the pilot to have a good view of the ground in landing. Again, the very narrow chord of the planes gave the pilot a very good view upwards and to either side.

Then, the triplane principle improved the maneuverability because the center of pressure travel on the narrow chords of the triplane is less than with a biplane or monoplane. This, in turn, permitted of a shorter fuselage and a smaller lever-arm between the tail surfaces and the c.p. on the main wings, with a greatly reduced inertia effect and quicker response to the controls.

There is no doubt but what the reduced "fly-wheelage," or inertia about the c.g., improves maneuverability. This might be something for our present day designers to think about when the only factor in their glossary seems to be more speed and more horsepower. Speed alone is uavailing in conflict unless it is accompanied by at least a moderate degree of maneuverability. If a high-speed plane moves so fast that it cannot quickly dodge and turn, then it is licked from the start. The super-speed fighter is only good for beating pursuit on the way home and this is surely not an essential factor of fighting.

Extreme horizontal speed with wide chord monoplanes is just an added hazard, without improving the fighting ability. It calls for large landing fields which are not always available in war, and clipped wings destroy the gliding angle, to say nothing of the loss of lateral control with the clipped wings. There is a great deal of merit in the triplane idea which will probably be revived again in the next war when there is no time in which to experiment.

Following the lines of the Pup rather closely, is the renowned Sopwith "Camel" with its humped fuselage. The Camel probably did more to repulse enemy aircraft than any other Allied plane. It was a redoubtable fighter against enemy planes and an excellent Zeppelin strafer. Its great climbing ability enabled it to overhaul a Zep when ballooning with ballast out and engines full ahead. The Camel carried two machineguns firing through the propeller and was fitted with a 130 h.p. Clerget.

It was the first fighter, in fact, to be provided with two machine guns, a practice that was quickly copied by both Allied and enemy designers. A heavy stagger to the planes, the forward location of the pilot and slots in the upper wing gave excellent visibility.

A sea-going type of Camel, almost identical with the land type except for the detachable rear portion of the fuselage, was used for flying from the decks of seaplane carriers. The detachable or bifurcated fuselage, made it convenient to stow away on the ship. It was launched from the barbets of the ship which displayed a considerable efficiency on the part of the Camel to take off within such a short run.

March 17, 1917, saw the birth of the Sopwith "Snipe," designed for bettering the performance of the Camel. It was first fitted with a 200 h.p. B.R. engine and, owing to the large diameter of this engine, the section of the fuselage was circular for a considerable distance back of the cockpit. It did not appear over the front until well into the summer of 1918, but in the short time left to it, it made an enviable reputation for itself. The Snipe proved all that was hoped for it and made rapid inroads into the enemy air service.

In four days, a squadron of Snipe accounted for 36 enemy planes. They shot down 13 in one day. Major Barker, with a Sopwith Snipe, crashed four and drove down ten out of the 60 hostile machines which attacked him. At this rate, the enemy equipment and personnel would have soon been wiped out.

When equipped with an A.B.C. Engine the Snipe attained a speed of 156 m.p.h. and climbed 10,000 feet in 4.5 minutes. With the original B.R. 2 engine of 230 h.p., it had a speed of 121 m.p.h. and climbed 10,00 feet in 9.5 minutes. These

(*Concluded on page 405*)

Yes . . . You're Seeing Right!

New **20" HI-FLYER MODEL AIRPLANES** **50c** Each Post Paid

featuring the exclusive Scientific

BRIDGE TYPE LANDING GEAR

EVERY MODEL GUARANTEED TO FLY!

Each New HI-FLYER KIT contains:— Finished Drilled Prop, Finished Balsa Cowling (where needed), Finished Drilled Wheels, 2 Sheets Colored Tissue, Washers, Bottle Banana Oil, Bottle Cement, Finished Nose Plug, Finished Wire Fittings, All Ribs, Bulkheads, Fairings, etc., printed on Balsa, Rubber Motor, All Balsa Strips cut to size, Colored Insignia Sheet, Full Size Plans and Explicit Instructions to Build a Perfect Flying Model.

WACO MODEL "D" MILITARY
Army's new streamlined fighter. Flies far and fast. Contains finished balsa cowl and other machined parts. 50c postpaid.

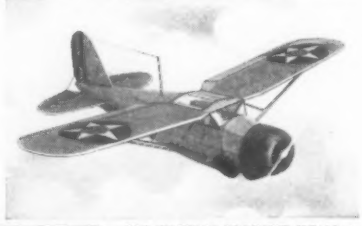
20" BENNY HOWARD'S "MR. MULLIGAN"
World's highest speed commercial ship. Carries four people at 314 m.p.h. The ship that won the big event at the 5th Annual Air Races. Kit includes finished cowl. 50c postpaid.

20" FOKKER D-7
A beautiful model and one that is full of performance. Exciting and easy to build—thrilling to fly. 50c postpaid.

20" ART CHESTER RACER
Easy to build. Flies and climbs beautifully. A most complete kit. Sure to satisfy. 50c postpaid.

20" BOEING FIGHTER XF7B-1
The most modern pursuit model of a low wing design. The speed of this plane is estimated at 300 m.p.h. 50c postpaid.

These 2 photos show landing gears retracted, but Kits include all materials to build them.



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2½", 3 for	43c
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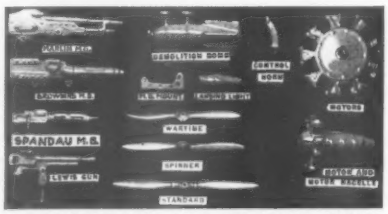

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2⅛"	ST. 15c	3"	SP. 25c	2"	ST. 15c
3"	ST. 20c	4"	SP. 35c	2⅛"	ST. 15c
4"	ST. 25c	6"	SP. 50c	3"	ST. 25c
5"	ST. 30c	2"	W. 15c	4"	ST. 30c
6"	ST. 35c	2⅛"	W. 20c	5"	ST. 40c
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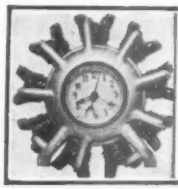

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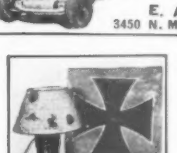

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CLEARANCE SALE—Lawrence 3-cylinder 60 h.p., good condition, spares, $100.00. Le Rhone 80 h.p. rotary, brand new, lots of spares, tools, $45.00. Tail surfaces, wing ribs, design data for experimental low-wing monoplane, $40.00. —Aircraft Development Company, 1530 Olive Street, N. E., Washington, D. C.

Barter and Exchange

Notices in these columns are confined to trades. Cash sale advertising must be inserted under the Directory or Classified columns. Notices in the Barter and Exchange columns, three cents per word.

AIRPLANES, ETC.

FOR SALE OR TRADE—Velie Monopup perfect —now flying motor overhauled. Best offer takes it. Jack Remsen, 78 Parkhurst St., Newark, N. J.

GYPSY MOTH—LICENSED, SHIP JUST RECOVERED. MOTOR 10 HRS. SINCE MAJOR, AIR WHEELS, COMPLETE SET OF INSTRUMENTS, GUARANTEE SHIP TO BE FINEST MOTH IN COUNTRY. WILL TRADE FOR J 6 5 SHIP. Let's hear from you. Joe Princen, Jr., Marshall, Minn.

SALE OR TRADE—Mead glider with damaged right wing or will buy right wing. George Gregory, 19 Roosevelt St., New Bedford, Mass.

AMERICAN EAGLET—Two place licensed Zekely thirty-horse powered monoplane. Will trade for Travel Air or sell for $400. Write Paul S. Bloom, 1920 Farnam, Davenport, Iowa.

FOR SALE OR TRADE—Two passenger 30 horse-powered licensed Eaglet. Never cracked. Motor just overhauled. Paul Bloom, 1920 Farnam St., Davenport, Iowa.

CRACKED 0x5 SWALLOW—Two wings, tail group, engine perfect; fuselage slightly bent; plenty instruments. Trade as down payment on light plane, auto or what have you? Mathis, 825 W. 12th, Anderson, Ind.

SELL OR TRADE IDENTIFIED—Three place closed Monoplane with 22x10x4 air wheels, Bendix Brakes and 10x3 Tail Wheel minus Kinner motor mount and tanks. Plane builders, here is your chance. Will dispose of all for what Air Wheels are worth.—Edgar Eate, 164 Frances St., Portland, Maine.

LOOK—Gas powered (Brown) model Fairchild "22" and 1930 Ford DeLuxe Coupe (13,000 M.) both perfect. Interested in any plane. What have you? Consider light crack-up. Will lend photos, if necessary.—Ted Chase, Berlin, N. H.

PIETENPOL FORD A CONVERSION partially completed, rebored, new pistons, Pan and oiling system finished, less head, water pump, carburetor, and prop. Have mag, radiator, motor mount, and cowl, also Pietenpol tank, for ?— J. W. Rogers, Roundup, Mont.

SALE OR TRADE—"Buhl Bull Pup" in perfect flying condition. Can be licensed as is.— Harry E. Myers, Thomasville, R. D. No. 1, Penna.

YOU FURNISH me with two cracked ships. I rebuild one, and relicense for you, and take the second for pay. You make the deal. I guarantee satisfaction.—Don Putnam, R. R. No. 3, Troy, Ohio.

CURTISS ROBIN for sale or trade-in on new car. OXX-6 new fabric, Licensed $650.—Walt Wellan, Napoleon, N. D.

TRADE—OX Eaglerock for car or ? ?—S. Clenenson, 480 Edith Ave., Johnstown, Penna.

WANTED—A lightplane in good condition or a sailplane. Have a 120 Bass Piano Accordian one year old, New Prism Binoculars, Majestic Car radio, two tube portable radio, new colt automatic and a one cyl. marine engine.—Edwin Parker, Hudson, N. H.

FOR SALE OR TRADE—Iden. Velie Monocoupe $300.00. Hissd E. Air Boss, 3 place Biplane priced to sell. Both ship and motor good condition. New props. fly away or delivered.— H. E. Warren, care of Rome Chevrolet Co., Cor. 6th Ave. & W. 1st St., Rome, Georgia.

SALE OR TRADE—New metal biplane fuselage with landing gear; single place. Similar to Geer Sport Biplane. A real bargain.—O. Z. Coon, Eros Route No. 1 of Okaloosa High School, Okaloosa, La.

TRADE MODEL A. FORD—Powered Midwing. A good flyer. For car, motorcycle, aerial camera or cash.—Brownee's Gift Shop, 714 Center Ave., Moorhead, Minn.

SALE OR TRADE—Aviation Mags., Cleveland Plans, Photos, etc.—Werges, 4806 Milentz Avenue, St. Louis, Missouri.

"SWAP FISHING OUTFIT FOR RIFLE".—E. Kent, 143 Peter Street, Buffalo, New York.

WANTED—Upper and lower right wings and center section for Waco 10 GXE, must be eligible for license except for coverings; state lowest price for cash or trade in first letter—S. M. Greenway, Route No. 1, Kannapolis, N. C.

SALE OR TRADE—AVIATION pictures from magazines. Trimmed. For details write Robert Krauss, 209 Marlboro, Ardmore, Pennsylvania.

WANTED—To Trade—6 tube Auto Radio, Automatic Shotgun, High powered rifle and cash for light two place plane.—E. G. Francis, R. F. D. No. 1, Poplar Bluff, Mo.

YOUR OFFER—Rabal Kyack McDaniel, Itasca, Tex.

WANTED—Typewriter—McDaniel, Itasca, Tex.

YOUR OFFER—Scout Transmission; McDaniel, Itasca, Tex.

WANTED—Metal Lathe—McDaniel, Itasca, Tex.

"YOUNG MAN, 18, very much interested in aviation, desires job doing anything from working around plans to parachute jumping. High school education, energetic, clean, sober, ambitious. Will work for living wages. Won't someone please help me get started in aviation. Please write to Robert Kephart, Georgetown, Delaware."

TRADE OR SELL for $55.00.—3 cyl. 35 H.P. Anzani air-cooled engine complete with prop.— A-1 shape. Want Salmson engine.—Harold Herr, 249 Manor Ave., Millersville, Penna.

WANTED—Propeller and motor mount for a Heath Henderson Parasol.—J. P. Hyde, Clifton, Va.

OLD TOWNE MOTOR CANOE—Cost new $225.00. To trade for 40 H.P. Sight plane motor.—Renzo Flannery, Lodi, Wisconsin.

A New Idea for Lightplanes

(Continued from page 376)

proved plane to the general public, or to the members of the association at a discount. Arrangements could also be made with the various supply houses to furnish equipment and materials in large quantities at a reduced price. Under this latter arrangement, just think of the slash a machinist could make in the present cost of furnishing a converted auto engine or even building a new aero engine if he received an order for only 250!

The more I go into this, the more I am certain it is the solution to the problem that has stifled the desires of all lightplane fans. With your support and the support of the other pioneers of the lightplane, i.e. Long, Pietenpol, Corben, Hickman, and others, I am sure it would not take long to get such a plan under way.

I am going to start the ball rolling by mailing postcards to many of those whose names appear in the different columns of the July and August P. A.'s. The makeup of these cards is as follows:

Dear Mr. Jones:

Would you be interested in an association whose aim is to have designed and stressed a lightplane that could be built by the home builder for less than $400, and that would be licensed by the Department of Commerce?

Whether or not you are interested, kindly acknowledge the receipt of this card by writing to either of the below:

E. F. Owens,
Queens Flying Club,
3753 64th St.,
Woodside, N. Y. C.

Popular Aviation,
608 S. Dearborn St.,
Chicago, Ill.

END.

XUM

Gates Circus

(*Continued from page 390*)

Pang was just managing to keep from starving when three Chinese approached one day and asked him to teach them to fly. They explained that Dr. Sun Yat Sen, of the South Chinese Republic, had sent them across the Pacific to learn this new pastime of the gods.

The three Chinese, Hwang, Young and Nieh, knew very little English and Pang did not barnstorm China, so they were in for a rough session. Pang decided on a cartoon route as the most probable method. This was long before they began discussing aileron or dihedral or other terms. He soloed them and managed to give each about 25 hours of time apiece and collected about $2,700 for the three of them. This was a fair price for every time one of the Chinese took the Jenny off the ground, it was in danger of being planted or splashed all over the ground. The year 1921 was rolling out. On Christmas Day Pang bought dinner for five stranded flyers at a lunch wagon.

Ivan R. Gates was born in Rockland, Michigan, on January 15, 1890. He was a headstrong personality who always got what he wanted. When he was six, the family moved to Detroit. His father wanted him to go to Annapolis, his mother wanted him to be a minister. Somebody else made a choir boy out of him. Van got disgusted and left for California when he was 18 years old.

He became an auto racer, and sold cars in his spare time. He soon acquired wide fame on the dirt track and began looking around for another source of dare-deviltry. He accordingly bought the crashed remains of a Greene Pusher, rebuilt it and flew it in exhibitions. He was among that chosen group of Early Birds. Already known as an auto racer, he became widely known as an "aeronaut."

In 1912, he was seriously injured in an auto crash. At the time, his pockets were full of contracts to be filled with the plane. He then hired Didier Masson, the noted French flyer, to fufill the contracts. He then realized that his ability lay in the promotion end of flying and that it was better to book exhibitions and leave the spectacular part of it to others.

So successful was he, that he soon had a quartet of the finest exhibition flyers in the country. Didier Masson, Nels J. Nelson, Fred Hoover, and Bird-Boy Art Smith were his flyers. They were "the Gates Flying Troupe." In 1912, this troupe traveled from Detroit to San Francisco. At the outset of war, Gates became an instructor.

At the end of hostilities, Gates was among the few who refused to believe aviation was all washed up. Always on the lookout for publicity, he became the world's first *flying cop* at San Francisco. He made front page copy when he flew a prisoner, James Kelly, from San Bernardino to San Francisco. The prisoner protested aloud against the flight. He was afraid to fly, but was promised a light sentence if he consented. Then Gates joined the Gates-Purcell Aviation Co., in 1919. He was later affiliated with the Mills Aviation Co. of Chicago.

In the spring of 1922, Pangborn and Lowell Yerex, a noted British flyer, teamed up and Ivan Gates became their promoter and publicity man. Gates would go ahead, pick a field, arrange the publicity and the bunch would zoom in and stage a show. In the bigger towns or cities, he would stage an airmeet and all flyers within a radius of 300 miles would come flocking in.

Yerex was flying one of the newly released Standards. A Standard J-1 two-seater. The Standard was destined to replace the Jenny and the mixture of other war surplus ships as the barnstormer's pride and joy because of its unusual performance. The fame of the Standard lay in its ability to hop in and out of tight fields, carry bigger payloads, was more powerful, and was a better performer. The Jenny has always been referred to as, "Old Faithful." But the fact cannot be denied that the Standard is best remembered as "Old Reliable."

They opened the 1922 season with their first airmeet at Crissy Field, San Francisco. Pangborn's upside-down flying was one of the big attractions. Vance Breese was greaseball for them at this time. Their second big airmeet was at Fresno, Cal. The Chinese Pang had trained, came in handy there for awhile. They were billed as "China's Aces," until they got their F. A. I. licenses and went home to China.

EDITOR'S NOTE: The next article in this series of Gates Circus articles will be run in the January issue.

Nomograph

(*Continued from page 377*)

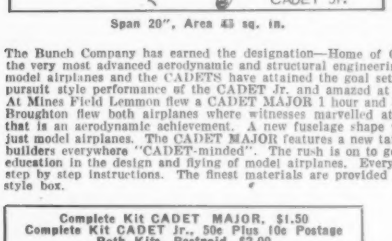
lbs. for passenger, 20 lbs. for seats, 10 lbs. for controls, 140 lbs. (35x4) for power plant, 6 lbs. for gas tank, 5 lbs. for instrument board, 10 lbs. for fire extinguisher, 48 lbs. for gasoline and 11 lbs. for oil.

Therefore, the sum of all removable weights will be 590 pounds. Laying the ruler through 590 on scale No. 1 and through *"gross weight"* on scale No. 2 (in the manner indicated by the diagonal line) we will find the ruler going through the gross weight of 870 pounds on scale No. 3.

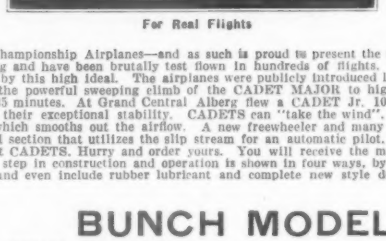
By the use of this chart the designer may find the weight of the structure, or its component units with a fair degree of accuracy.

END.

A REVELATION IN MODEL AIRPLANES



Span 20", Area 43 sq. in.



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Catalogue 3c stamp.

BUNCH MODEL AIRPLANE CO.
2303 S. Hoover St. Los Angeles, Calif.

Sopwith Planes

(*Continued from page* 400)

were marvellous speeds for those times and marked an epoch in aerial warfare.

A double-bay system of interplane bracing gave it great structural strength so that the most drastic of maneuvers and aerobatics could be engaged in without danger of the wings folding up as was the case with many of the ultra-light warplanes.

While seldom mentioned in war stories, the Sopwith Dolphin was an outstanding plane for offensives. It was designed with the purpose of utilizing the 200 h.p. Hispano-Suiza engine, which had reached a productive stage and, secondly, to afford a greater range of vision than had hitherto been possible.

The span of the Dolphin was greater than that of the Camel, a double-bay system of struts was adopted, the interplane gap was reduced and a negative stagger was given to the wings. The negative stagger avoided interference with the pilot's movements.

On the tubular spar extensions were mounted two Lewis guns capable of being aimed independently of the direction of flight. Two more guns (Vickers) were arranged on top of the engine and fired through the propeller. They were partly covered by the engine fairing. The whole design resolved itself into an excellent streamline layout which reminded one of the SPAD.

The radiator was divided into two parts carried, on the side of the fuselage, with a deflector plate for regulating the air-flow. There was a marked difference in the design of the tail-group, the rudder being of the balanced type while the fin is of a distinctly different form than with previous Sopwith planes.

At the time of the Armistice, a more powerful Dolphin was being built by the French government, both for themselves and the United States. It was fitted with the 300 h.p. Hispano-Suiza engine in order to carry a large quantity of fuel. The tail plane was adjustable in flight in order to take care of the variable loading, while the rest of the machine was reinforced to take care of the larger engine and heavier fuel load.

It came too late to prove what it could do in actual battle, but it is certain that it surpassed the Camel both in speed and climb. The guns were completely concealed under the cowling and arrangements were introduced to minimize the danger of fire due to back-fires, etc.

You will no doubt remember that the bird known as the Cuckoo delights in laying its eggs in the nests of other birds. This is a misfortune for the foster parents because the young cuckoos raise havoc with the nests of their hosts. And this was the reason, humorous as it may seem, for giving the name "Cuckoo" to the Sopwith torpedo plane which laid its eggs with disastrous results in many an enemy camp and city. The egg was an 18-inch torpedo hung below the fuselage. This was a large plane with a treble-bay wing bracing which was equipped with the 200 h.p. Hispano-Suiza geared engine.

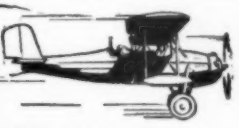
The Sopwith "Buffalo" was intended for reconnaissance and contact patrol work, the ship being armored for the protection of the pilot, observer, and fuel tanks against enemy gun fire. The experiments with the Buffalo were highly successful and it was on the point of being put into production when the Armistice was signed. It was fitted with one synchronized gun firing forward and one Lewis gun on the Scarfe ring. It was powered with a B.R. 200 h.p. engine.

Another descendent of the Sopwith Snipe was the "Salamander," but the latter was intended for an entirely different service. The Salamander was designed for the purpose of making life in the trenches particularly hot for the enemy, and to this end was protected with armor plating and provided with two fixed machine guns. This has a very modern appearance with its deep streamlined body and compact cowl.

The armor, which extended from a point just back of the engine to the rear of the pilot's cockpit, was the main structural member and was not simply hung on a standard structure. The total weight of the armor was 650 pound while an additional load of 2,000 pounds in the form of ammunition was carried for the guns. The engine was a B.R. of 200 h.p.

END.

for Success in AVIATION



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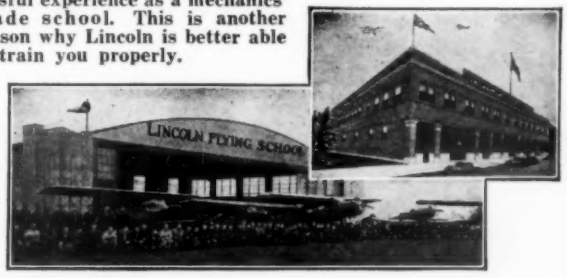

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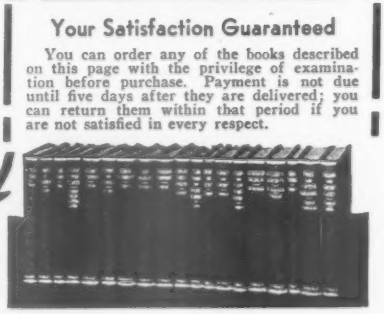

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